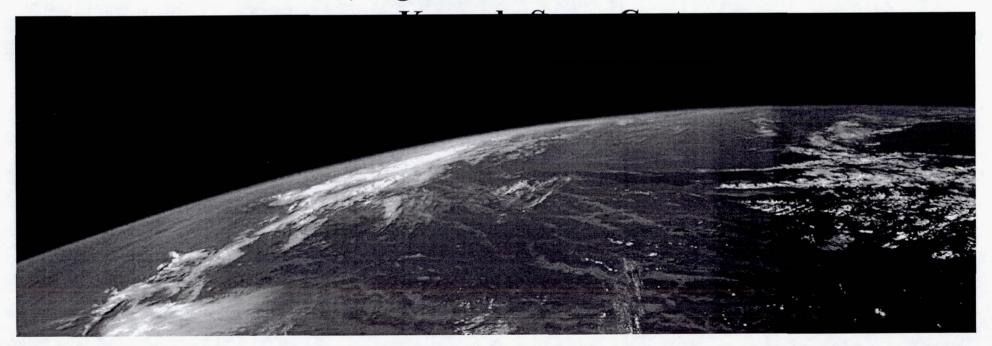


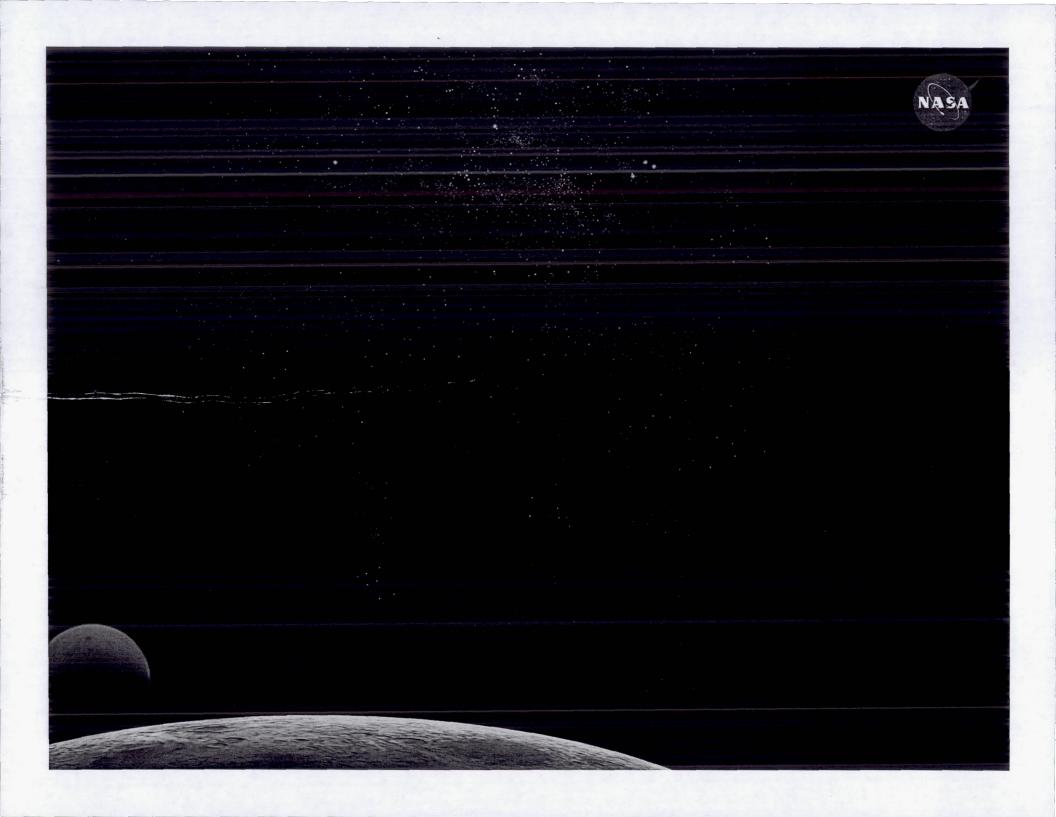


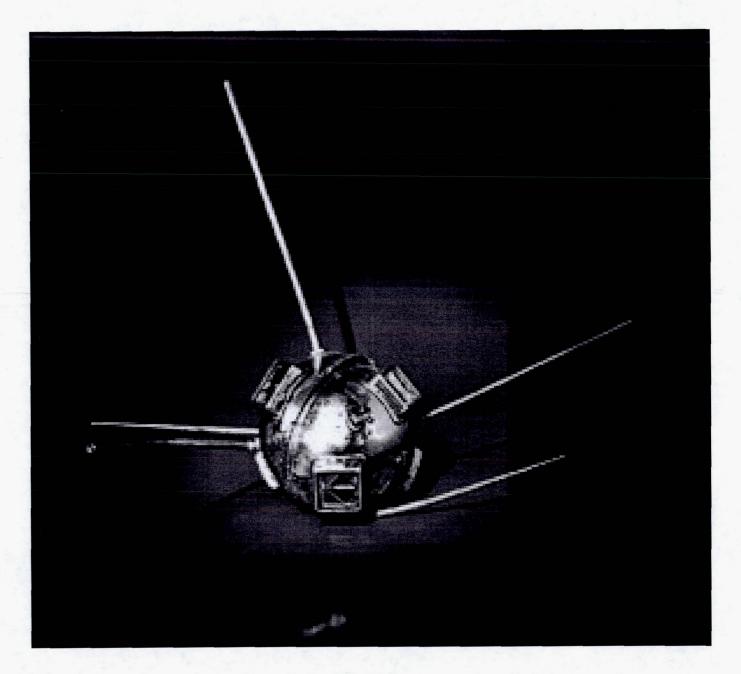


**Aicheo** 

## Directór, Ingeniería de Sistemas Operacionales







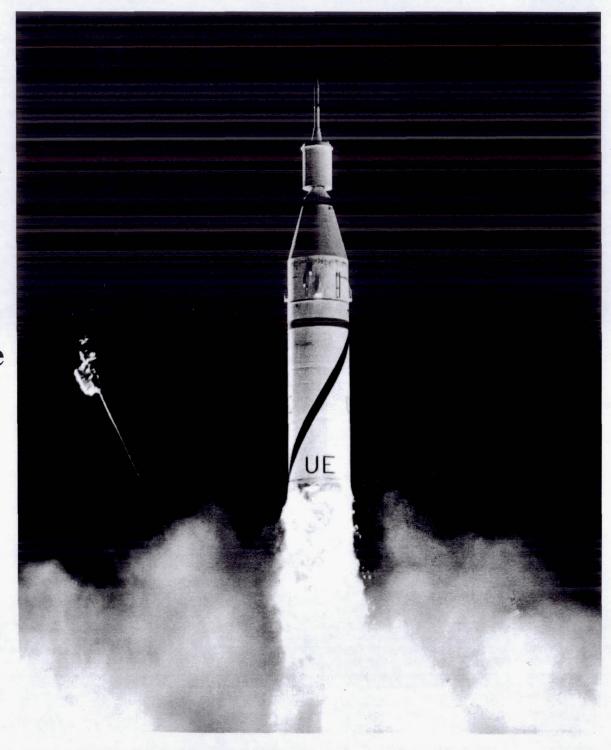
Vanguard 1 recovered after launch failure 1957

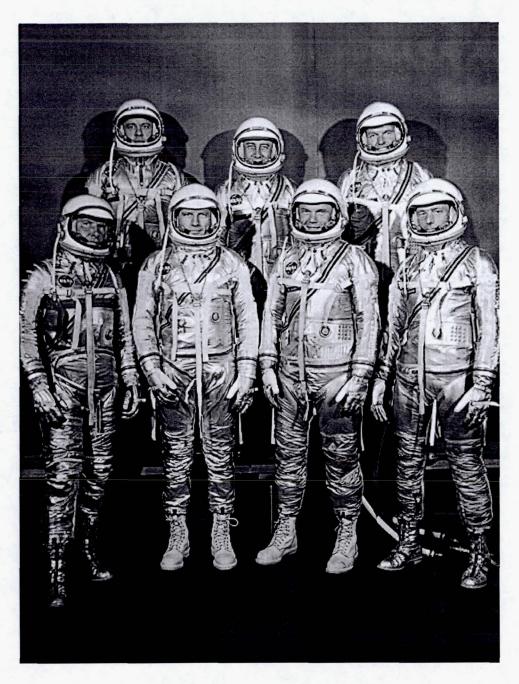
Explorer 1
The first successful
American satellite launch

January 31, 1958

U.S. Army Ballistic
Missile Agency, under the
direction of Dr. Wernher
von Braun.

It discovered radiation belts around Earth, which were named the Van Allen Belts after the scientist who led the research.





#### April 1, 1959 - First NASA Astronauts Selected

Alan Shepard Virgil I. "Gus" Grissom Gordon Cooper

Walter Schirra,
Donald "Deke" Slayton
John Glenn
Scott Carpenter

NASA Project Mercury thrust America into the space race They were the first seven Americans to go into space - and the only Americans to go into space alone.

### May 5, 1961 -- First NASA Astronaut In Space





# **Alan Shepard**

"Freedom-7"

Altitude: 116.5 statute miles

Orbits: 0

Duration: 0 Days, 0 hours, 15 min, 28 seconds

Distance: 303 statute miles

Velocity: 5,134 mph

Only 20 Days Later ...

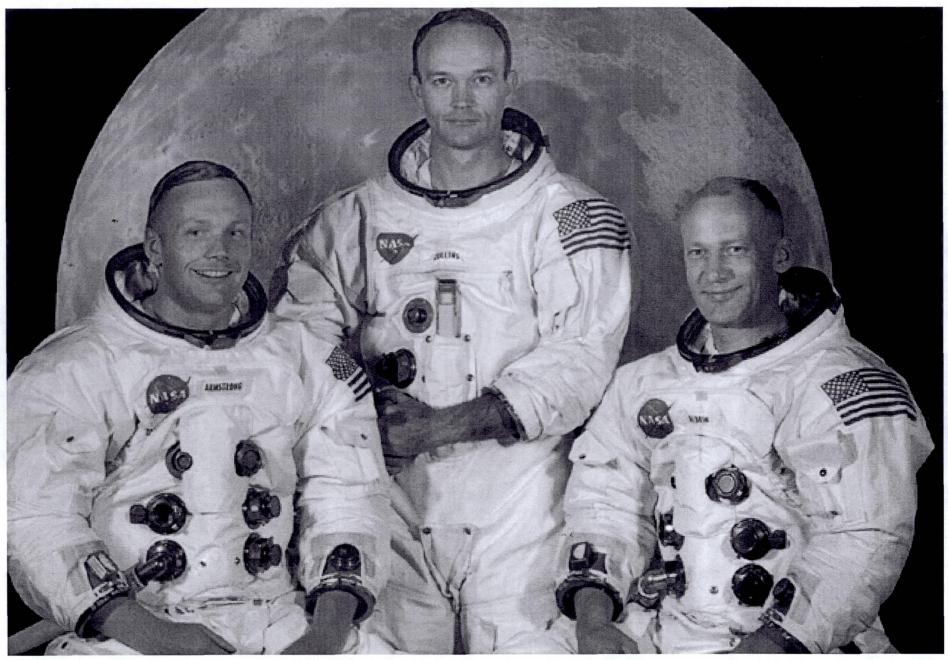


"I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth "



President John F. Kennedy May 25, 1961

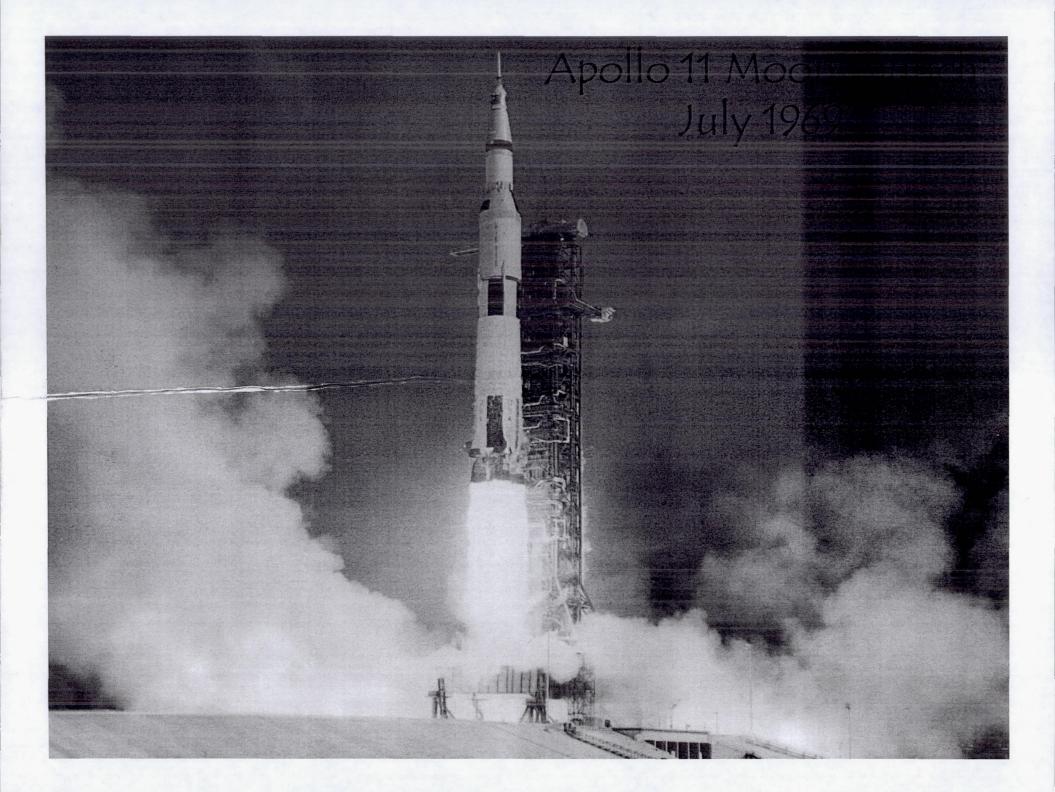




Mission Commander Neil Armstrong,

Command Module Pilot Michael Collins

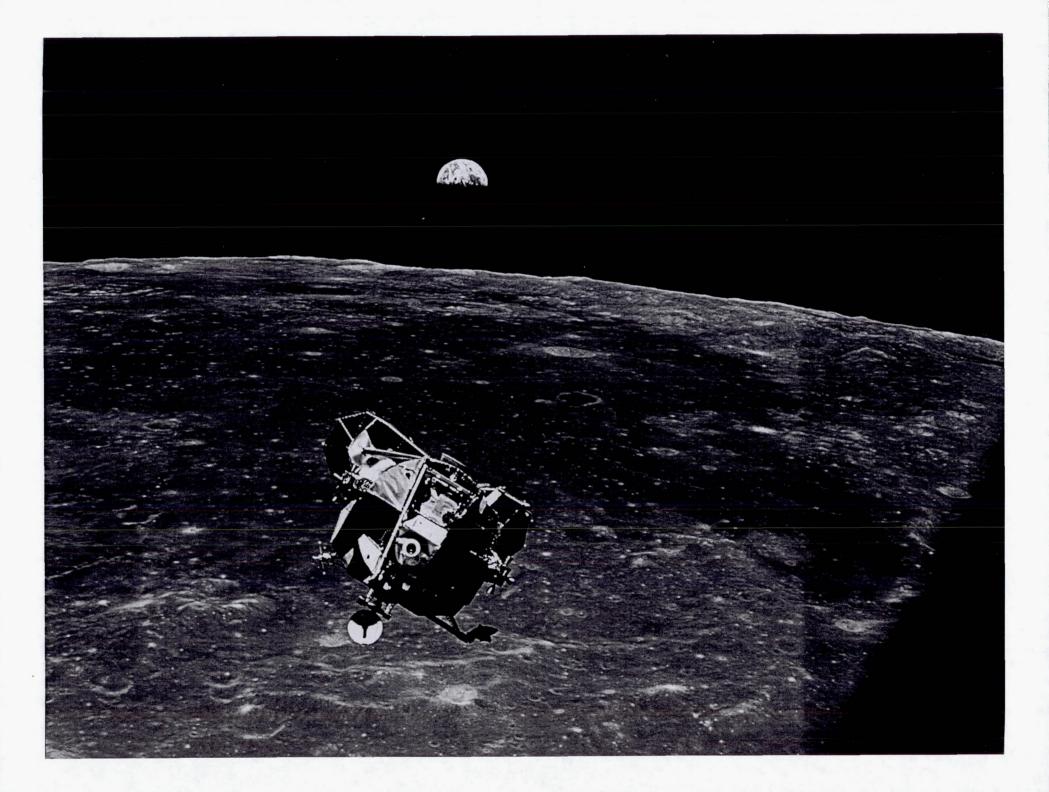
Lunar Module Pilot Edwin E. Aldrin Jr.



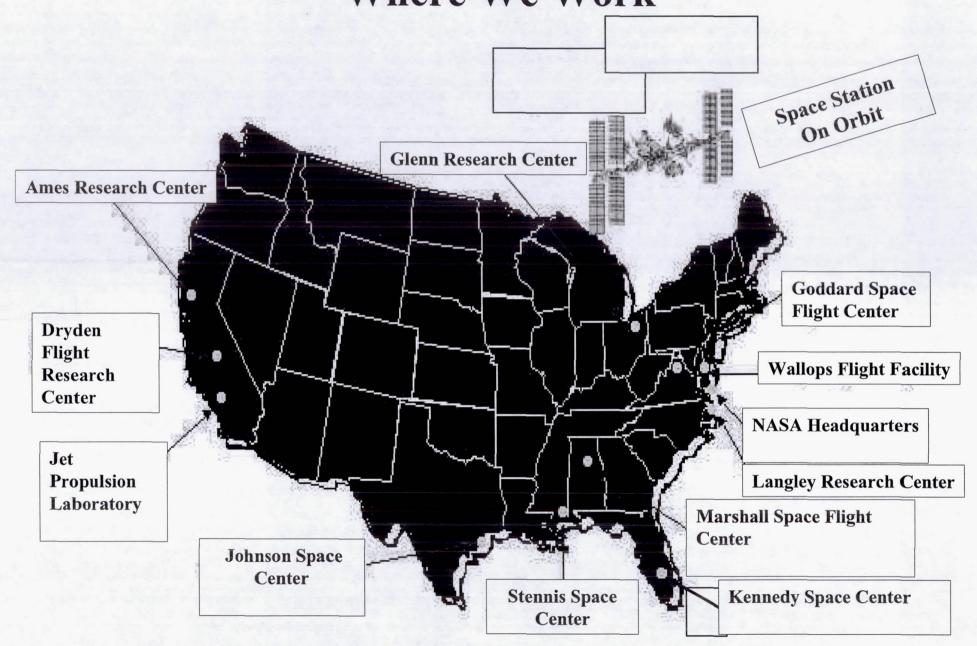


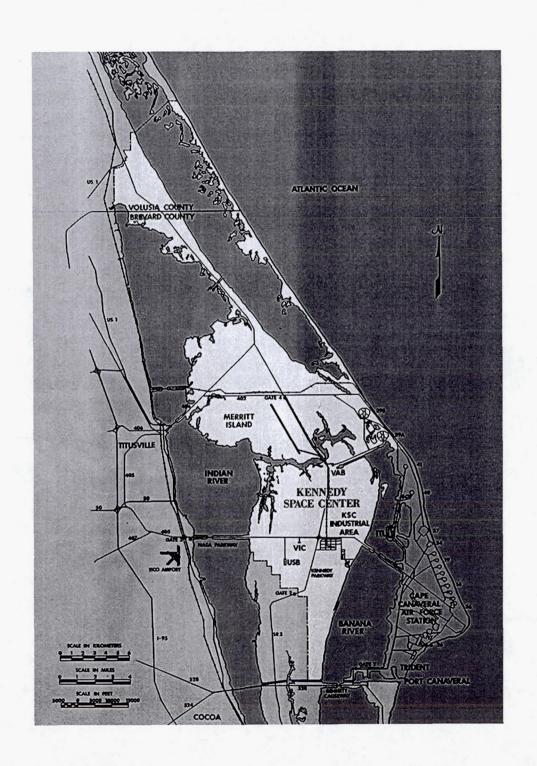
Apollo Moon Launch

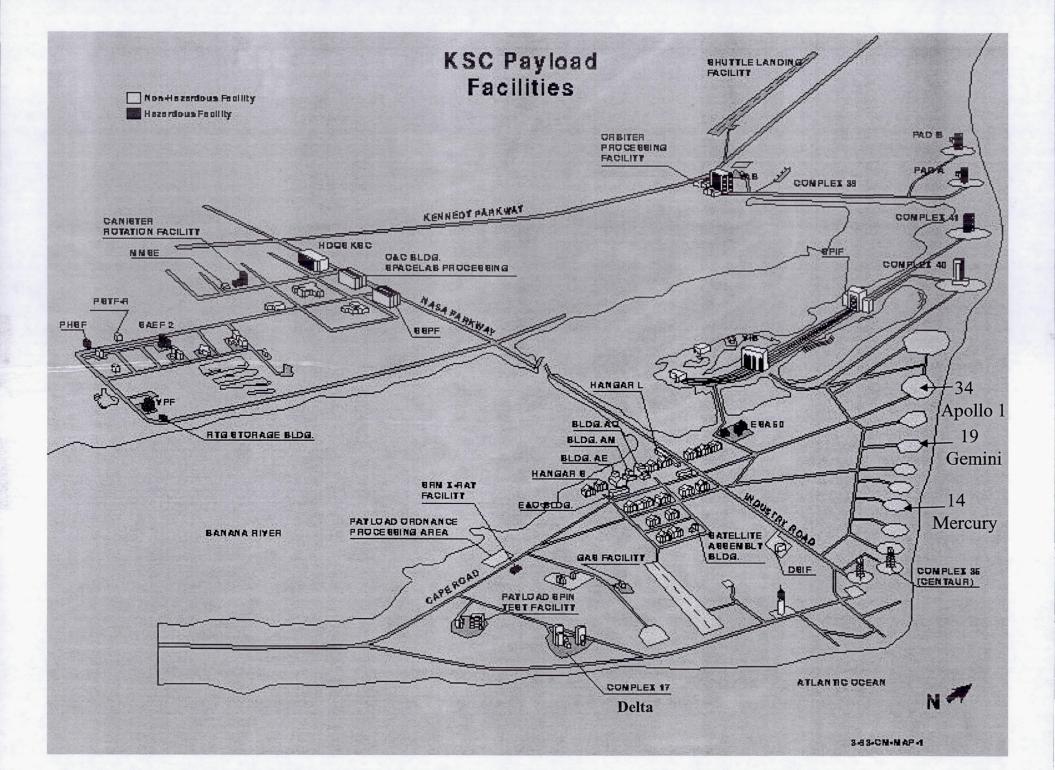




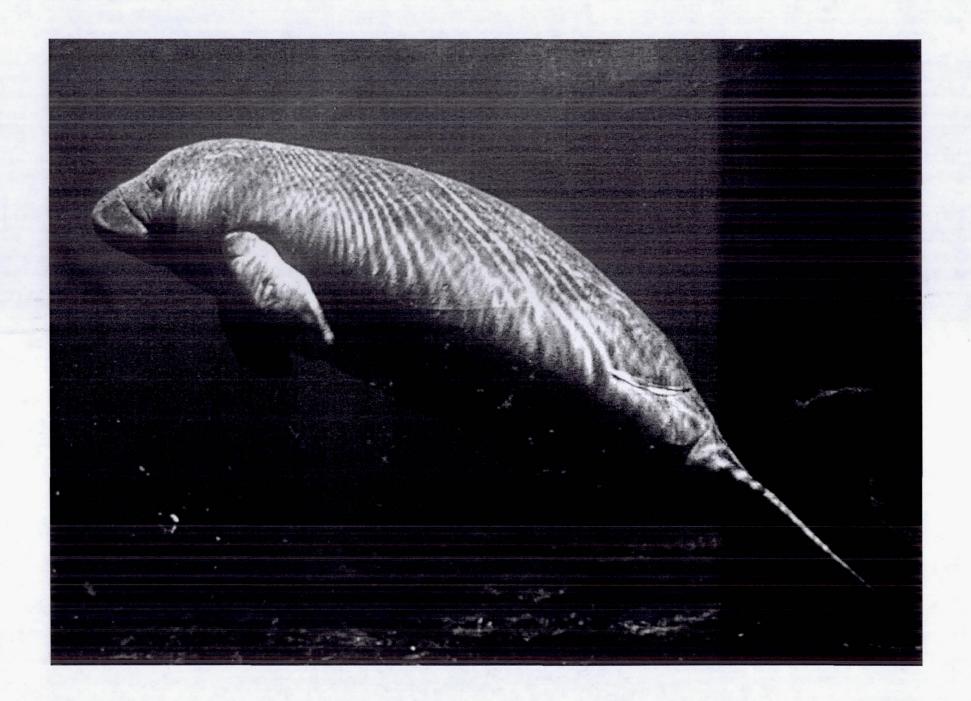
## Where We Work

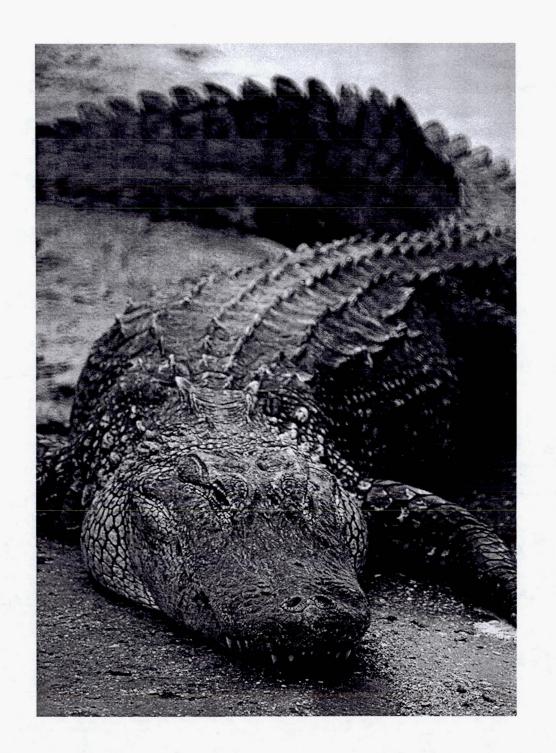


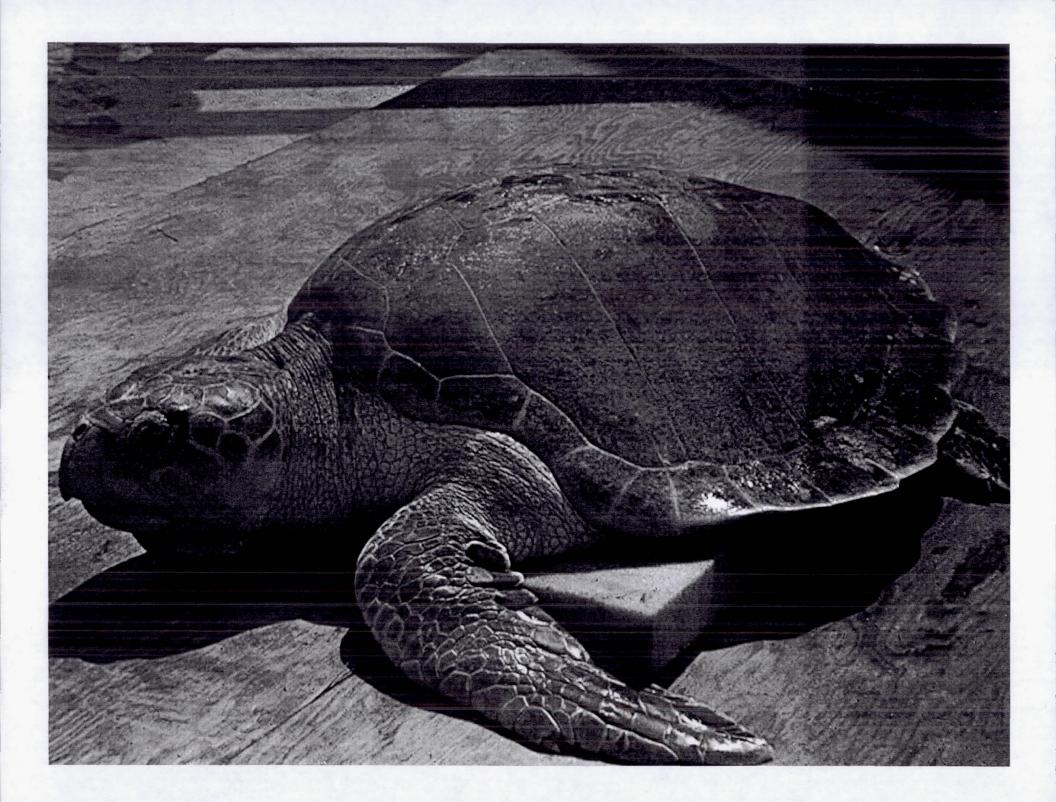


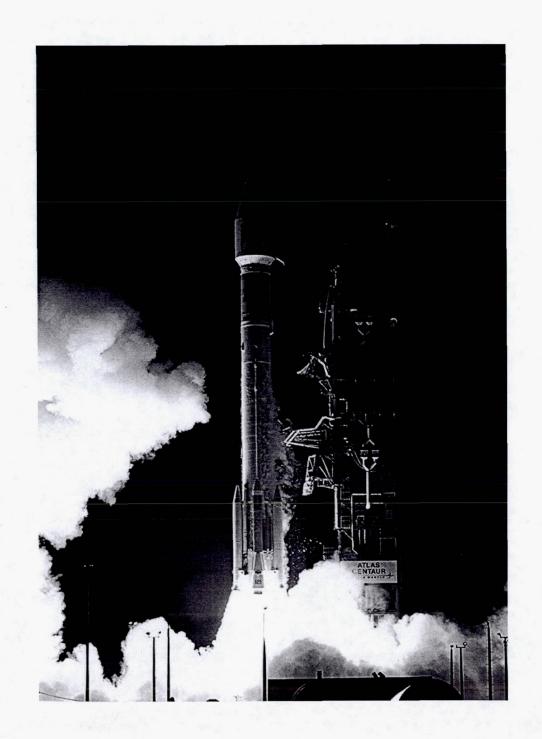




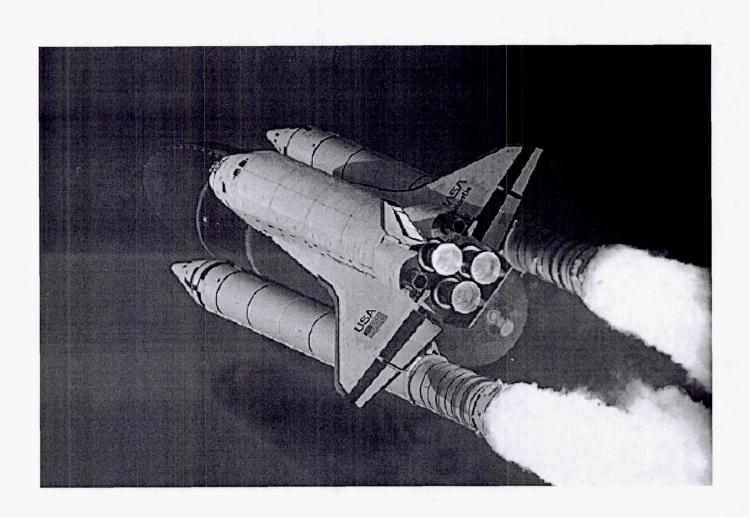






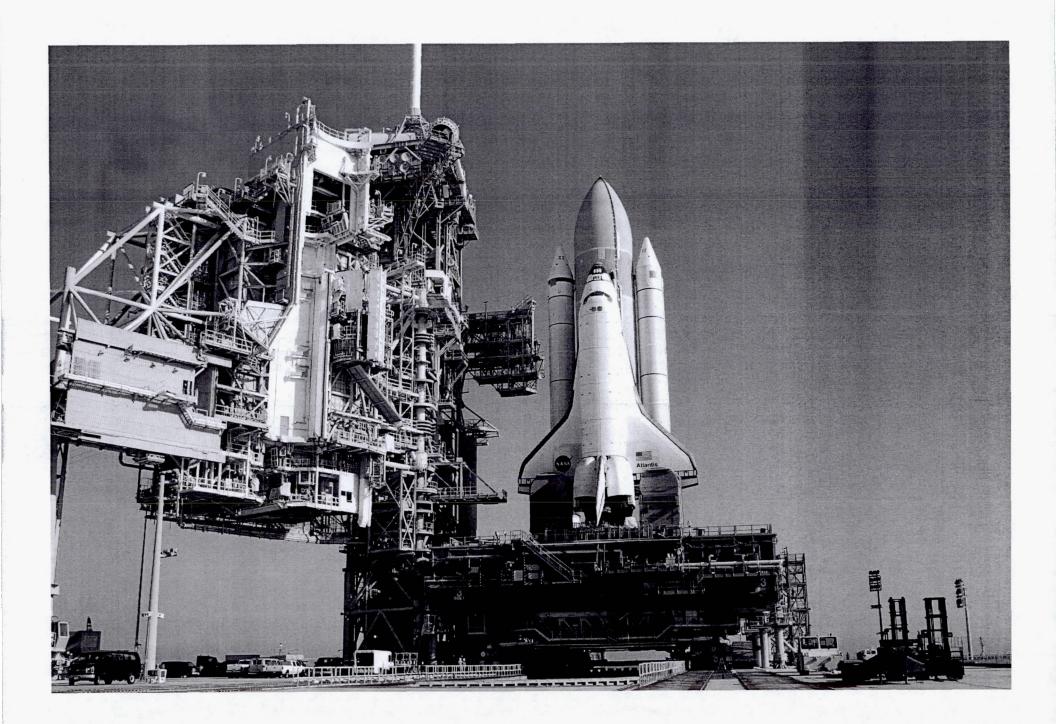




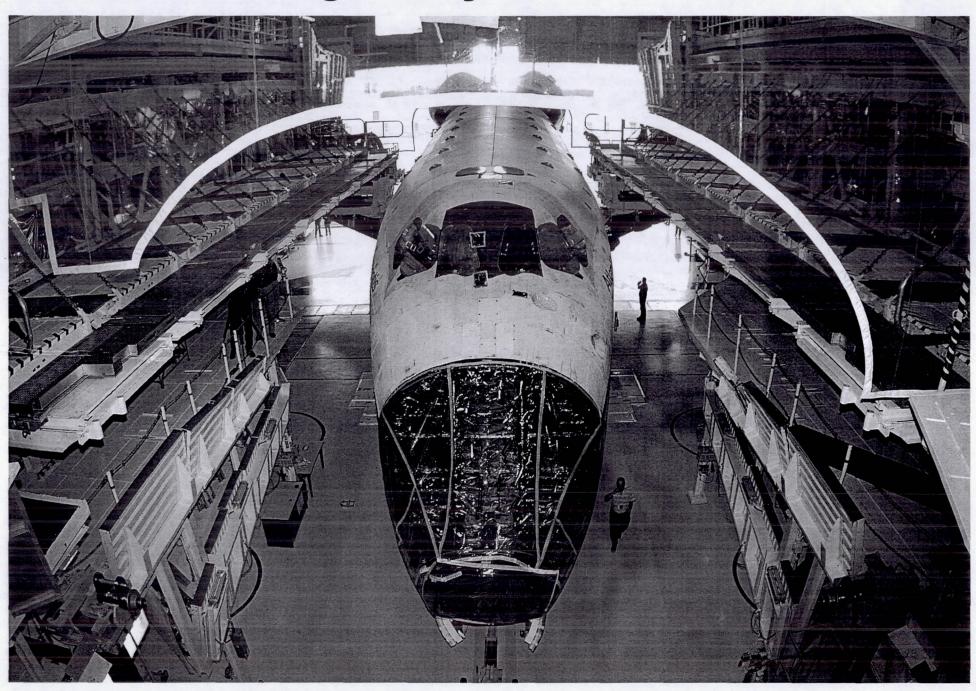


April 12, 1981 Space Shuttle STS-1

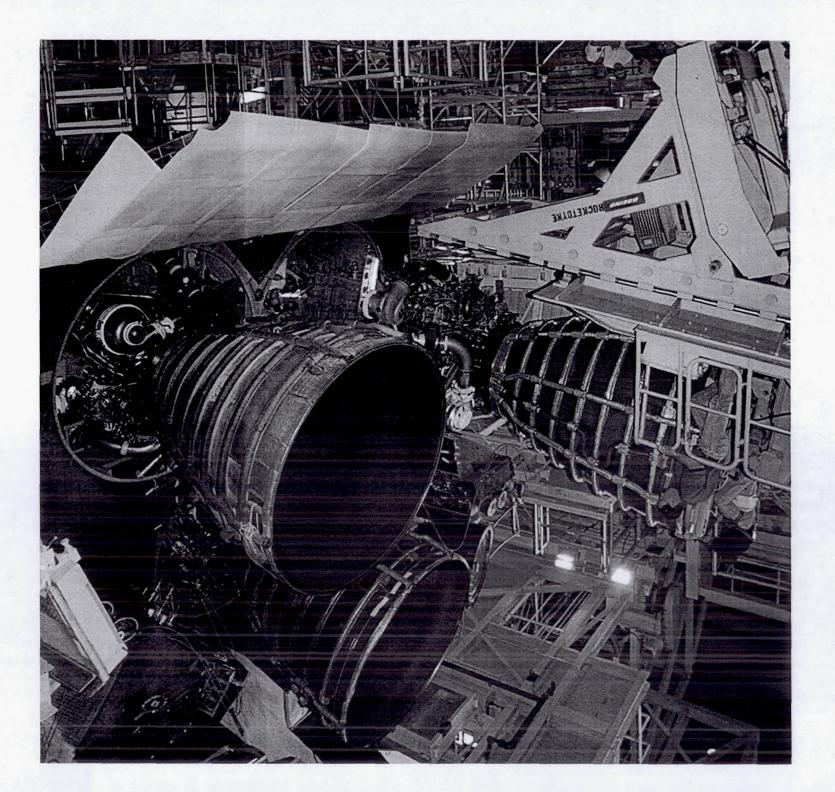


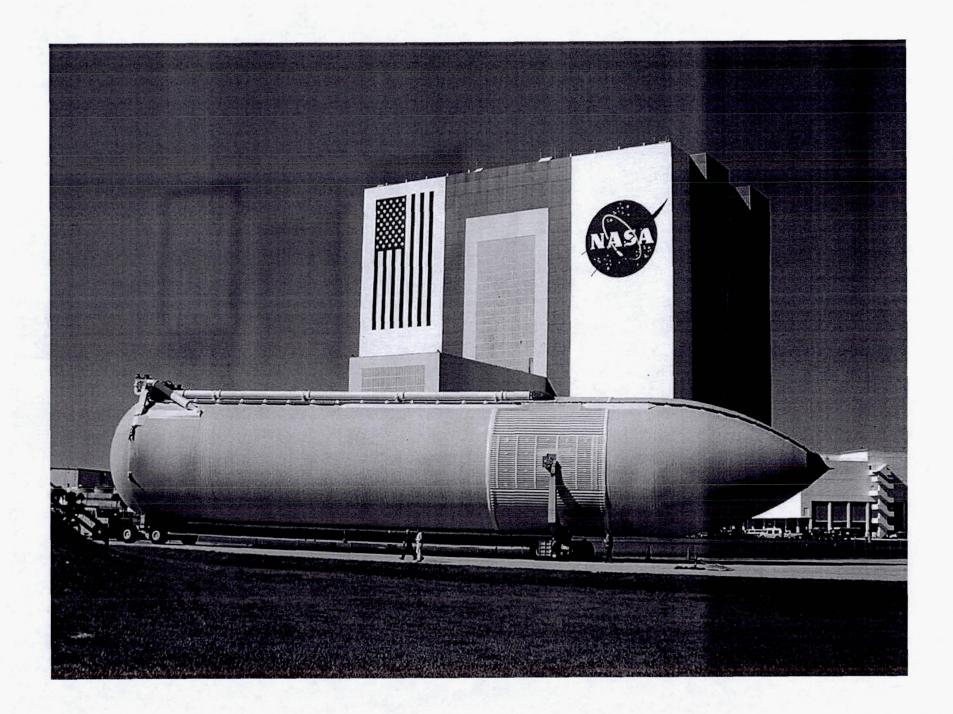


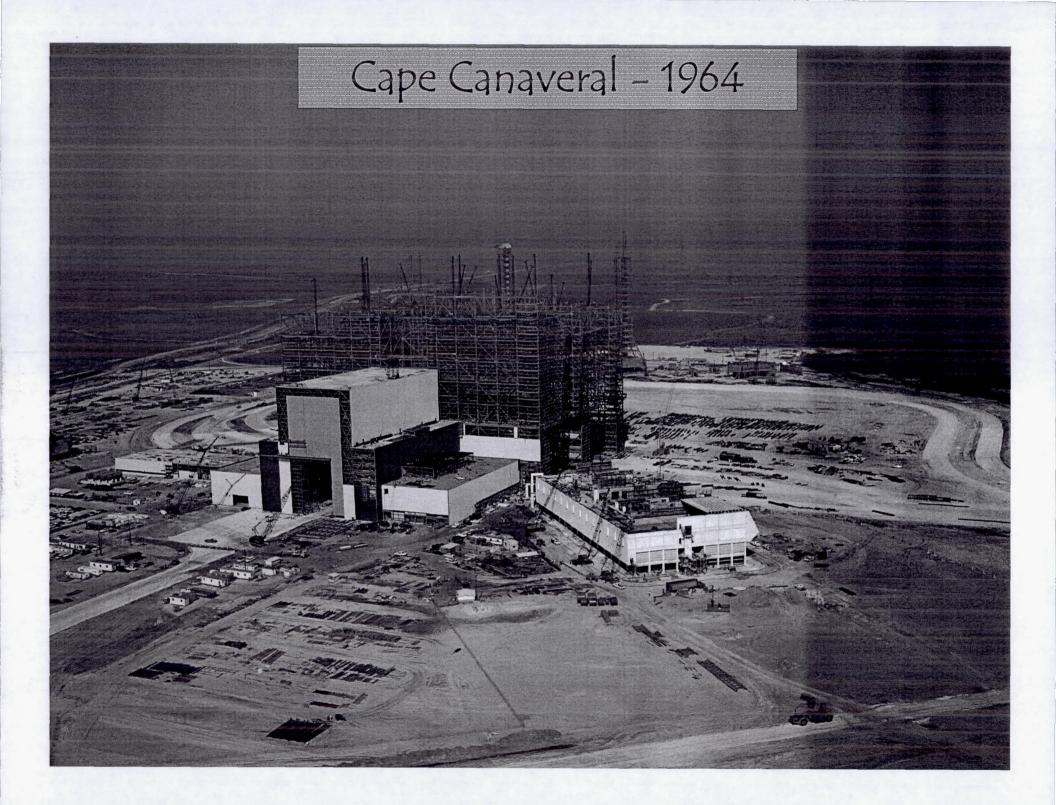
## **Orbiter Processing Facility**





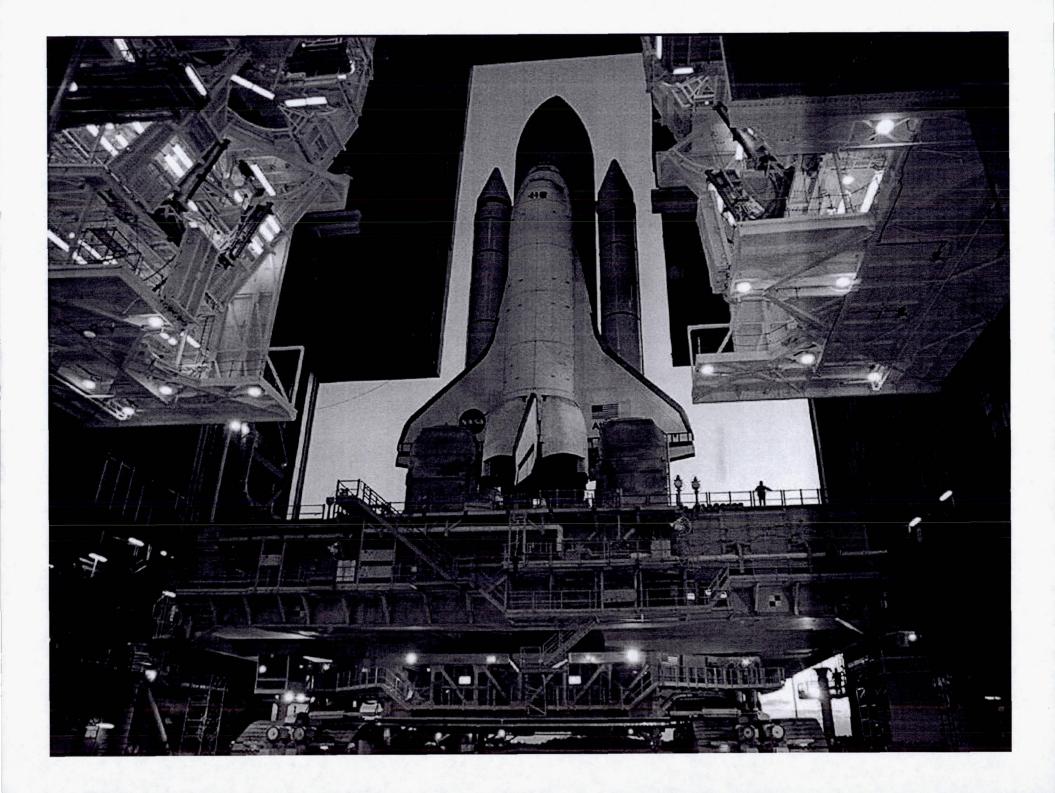


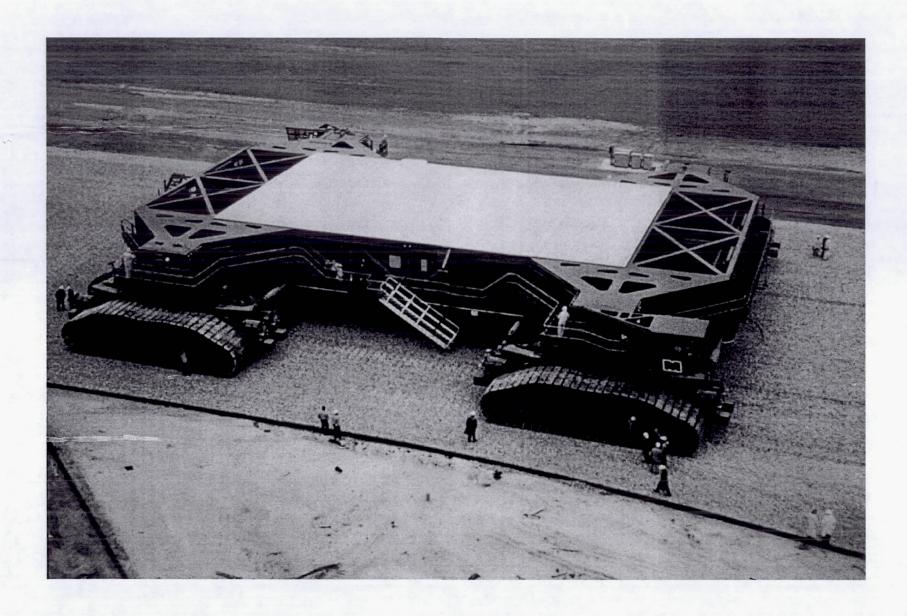


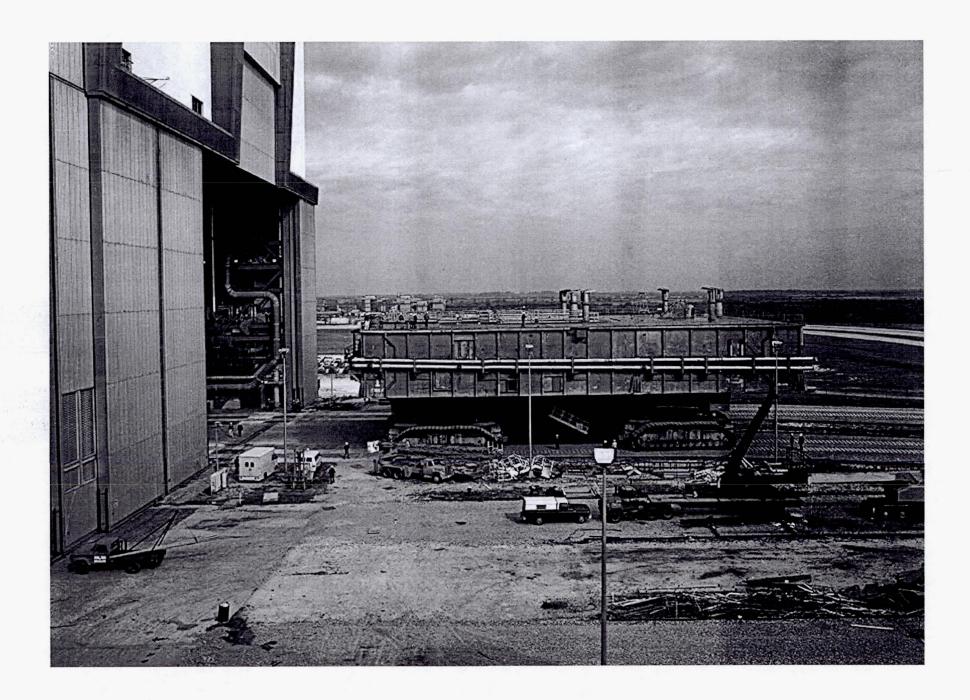




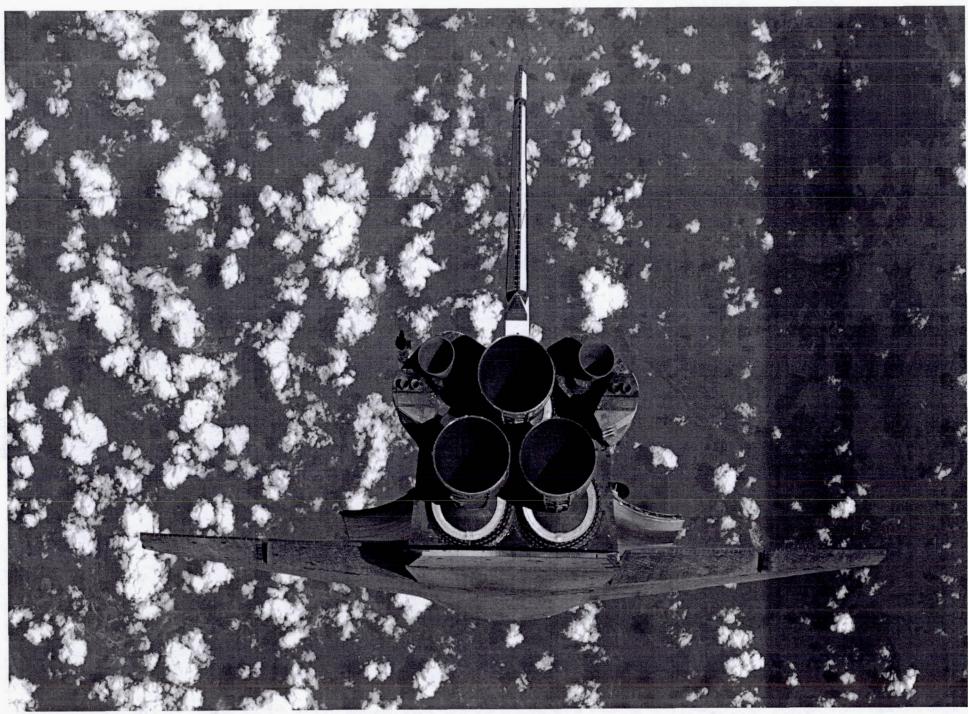
The college of the co



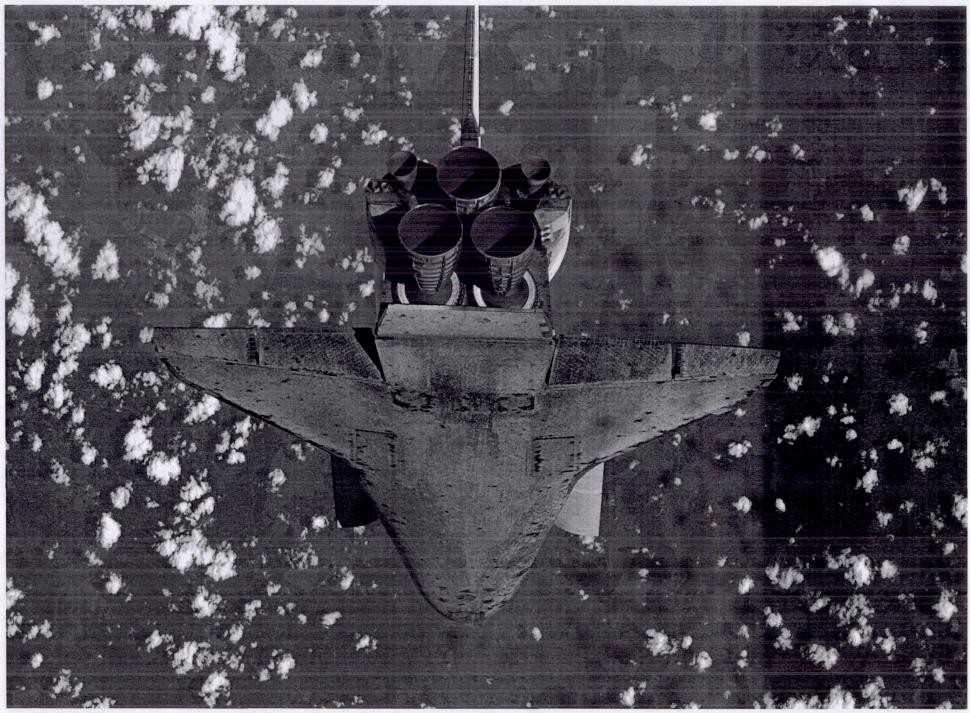








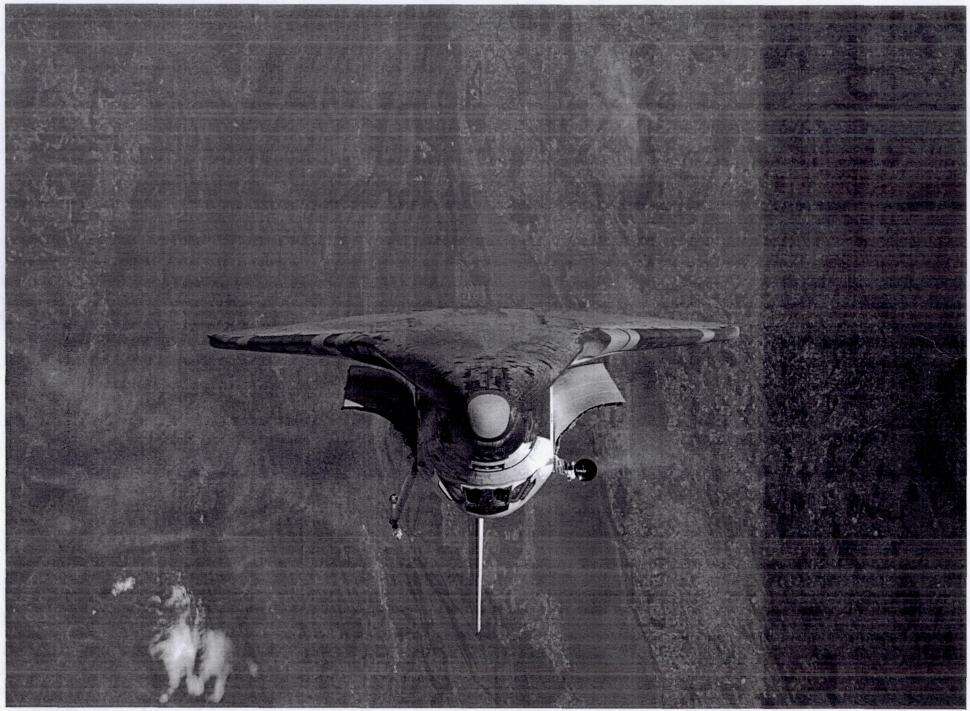
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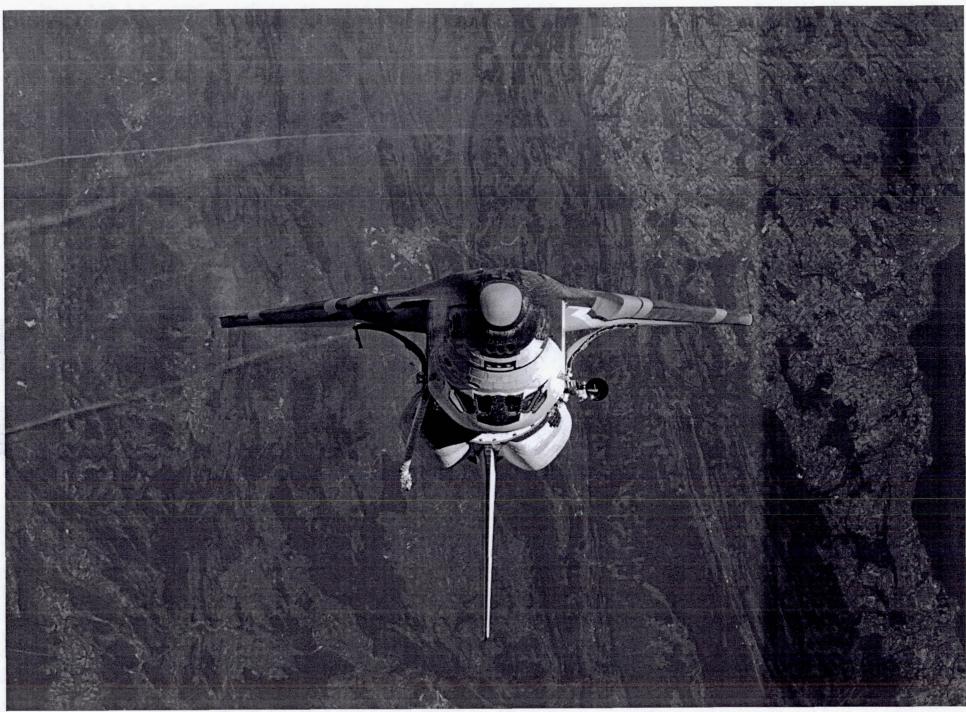
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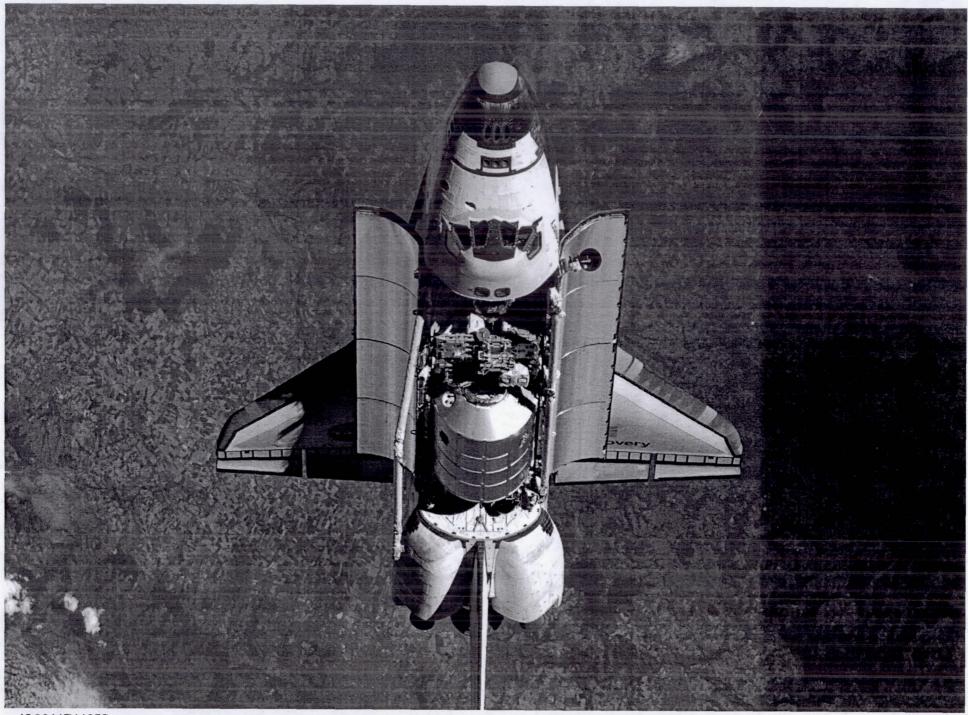
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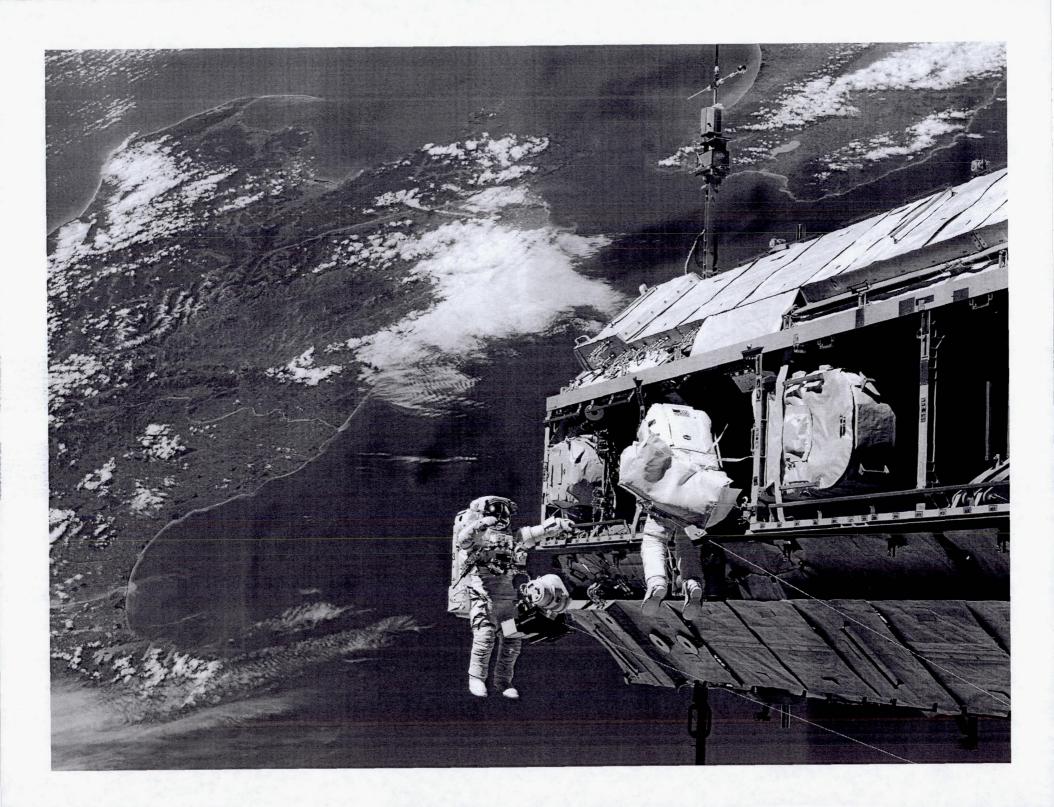
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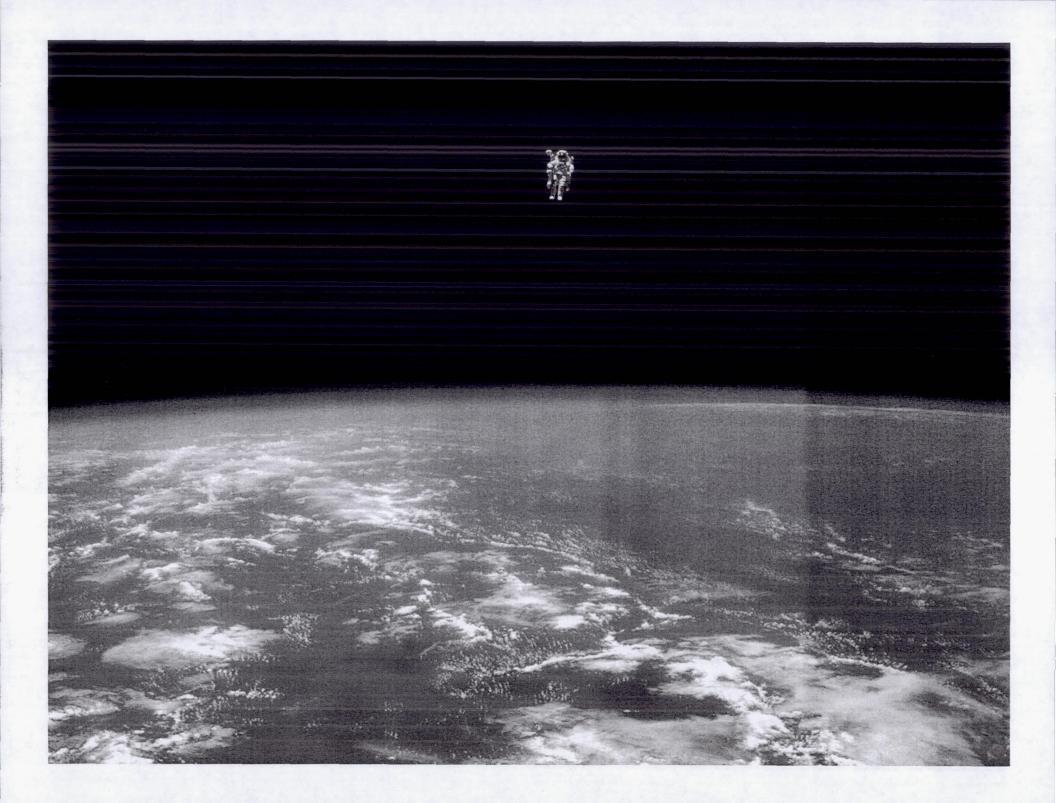


ISS011E11257

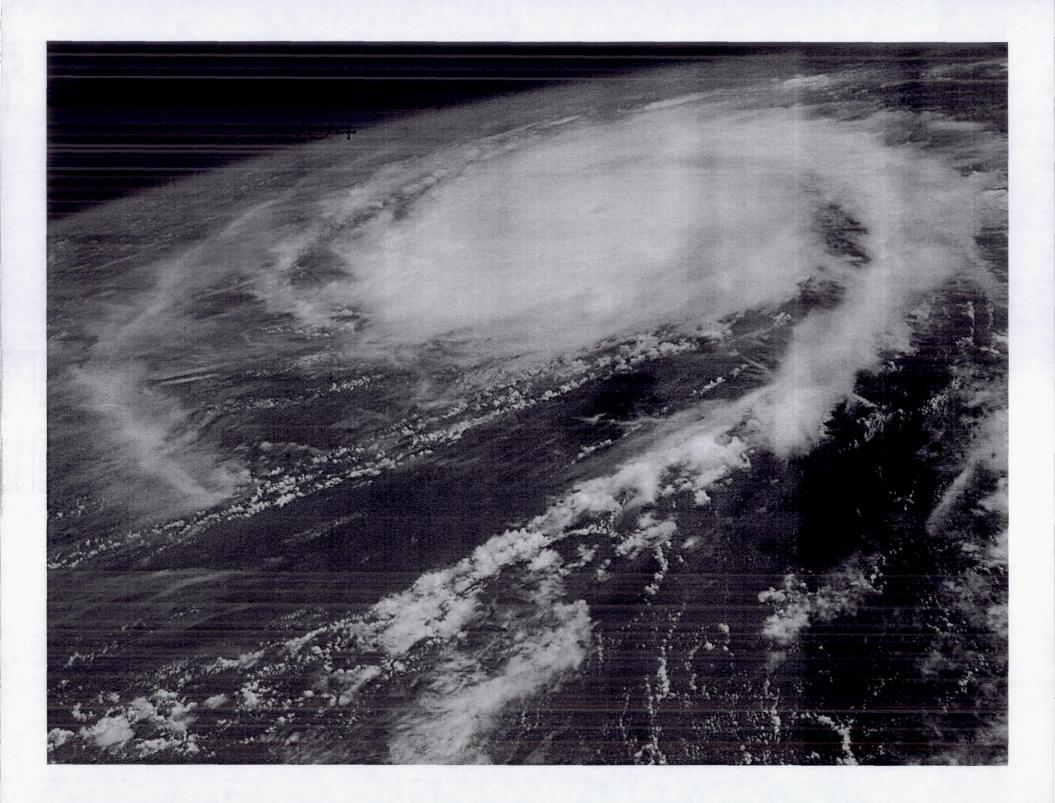


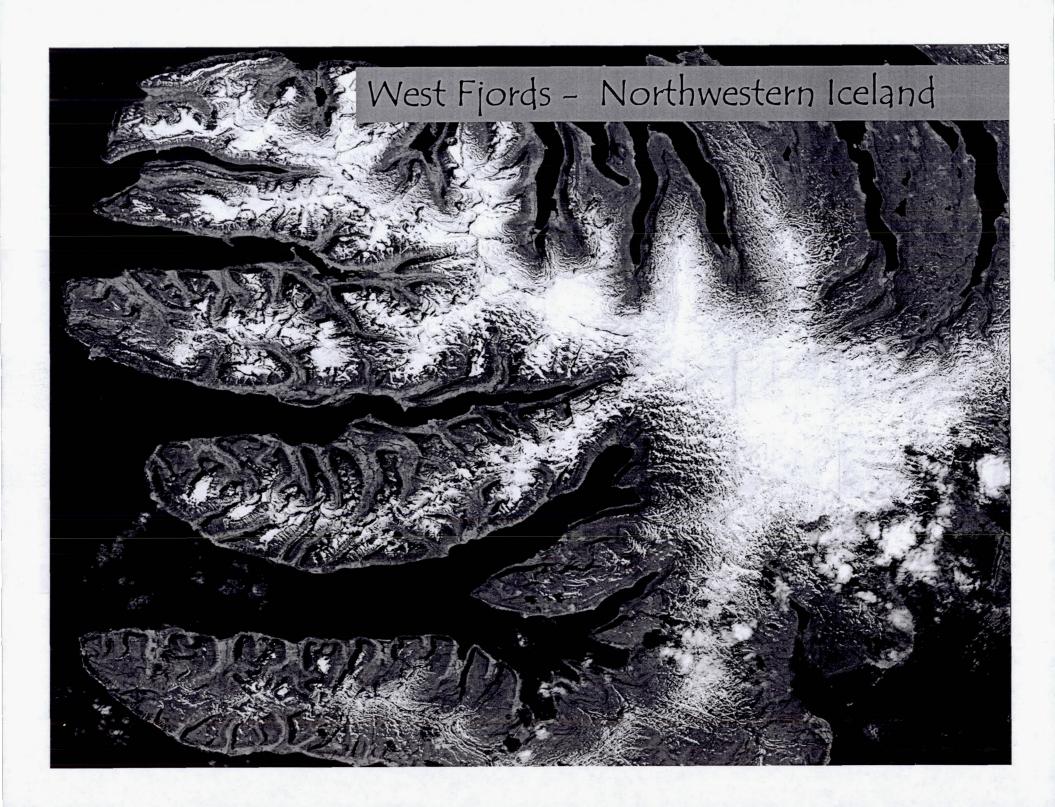
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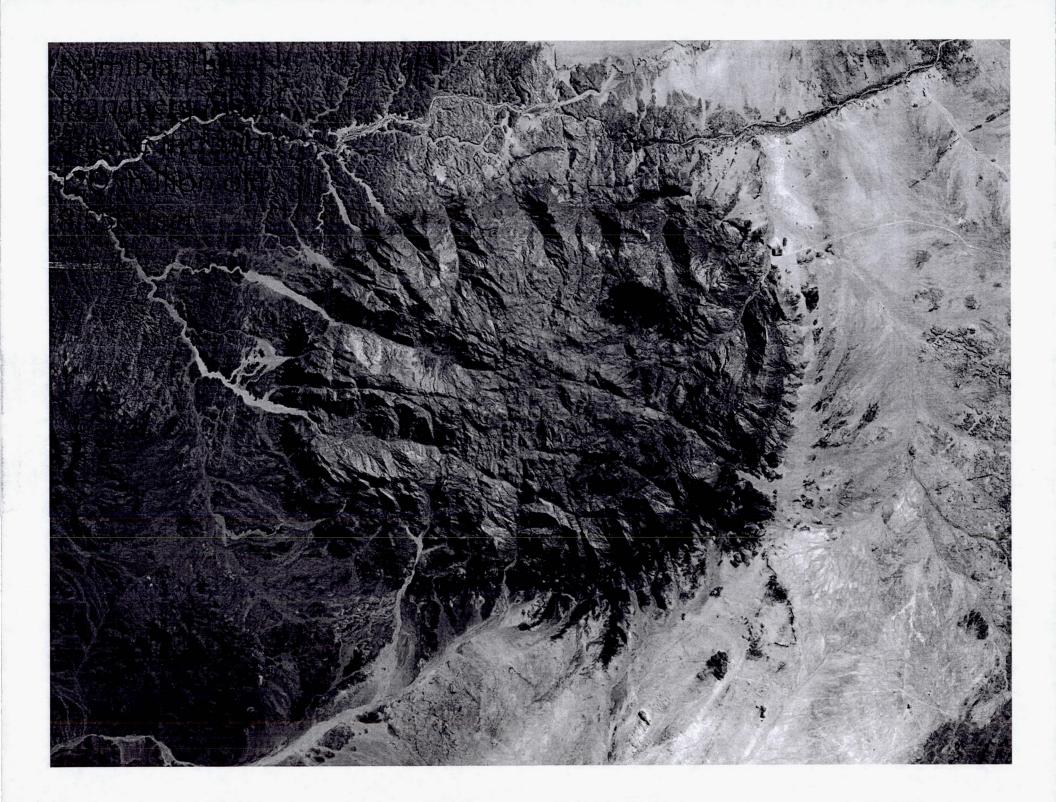


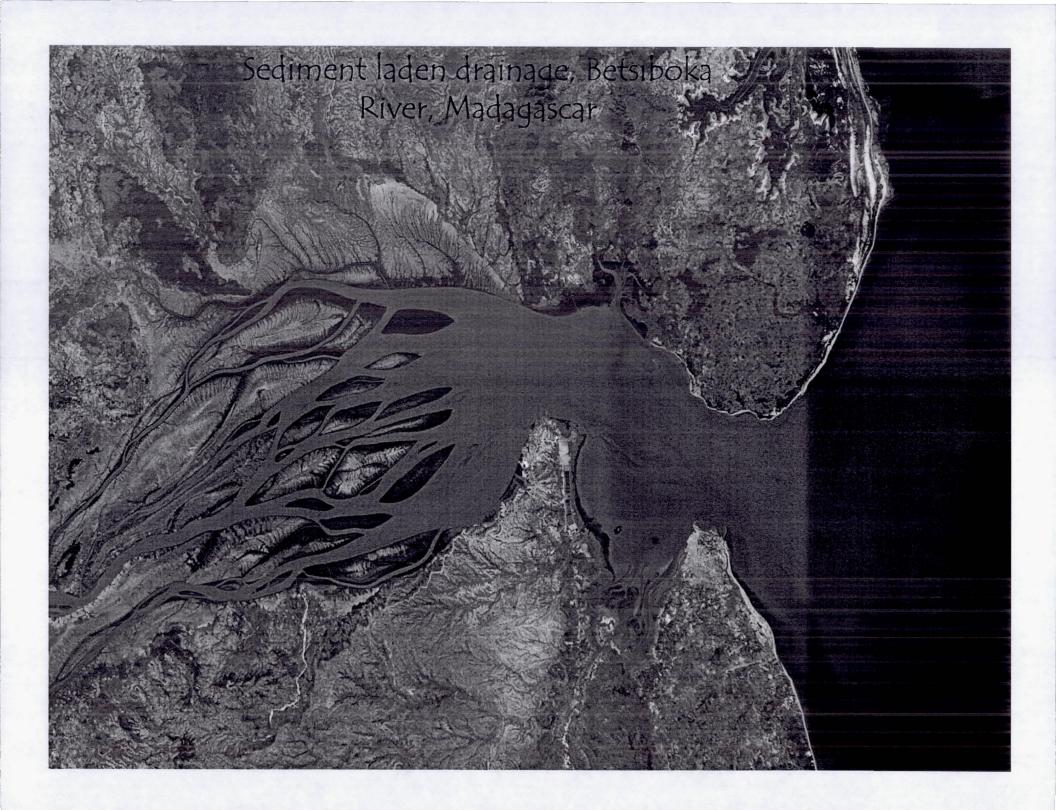


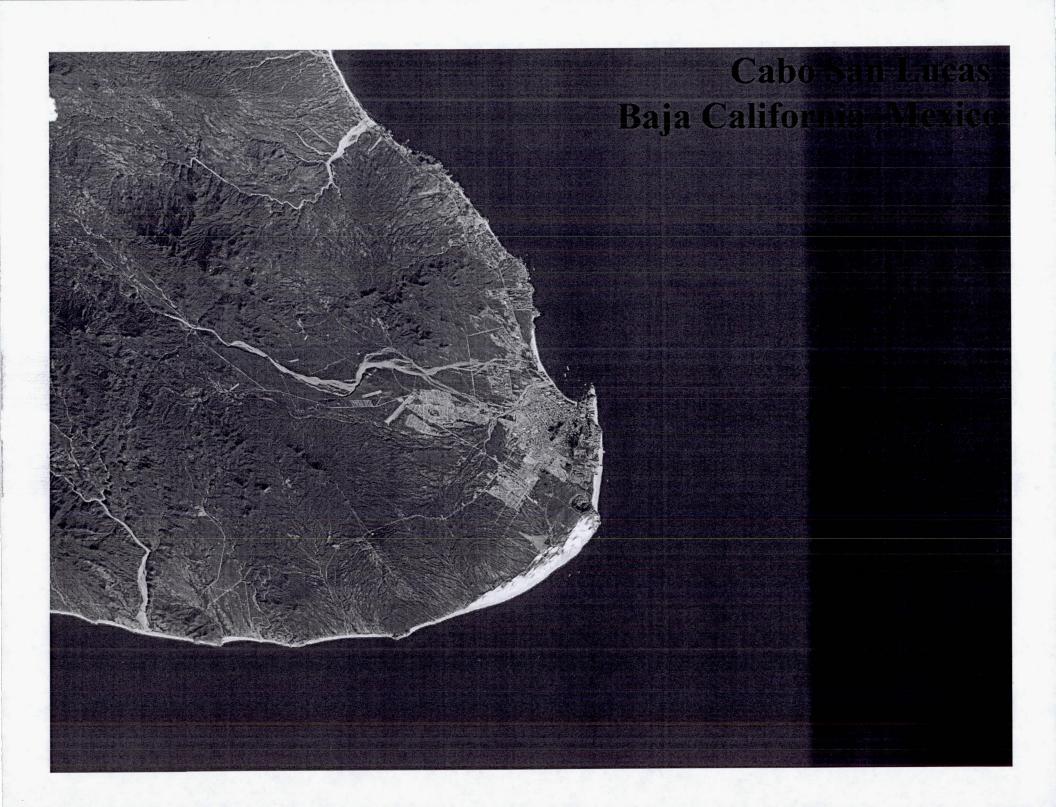




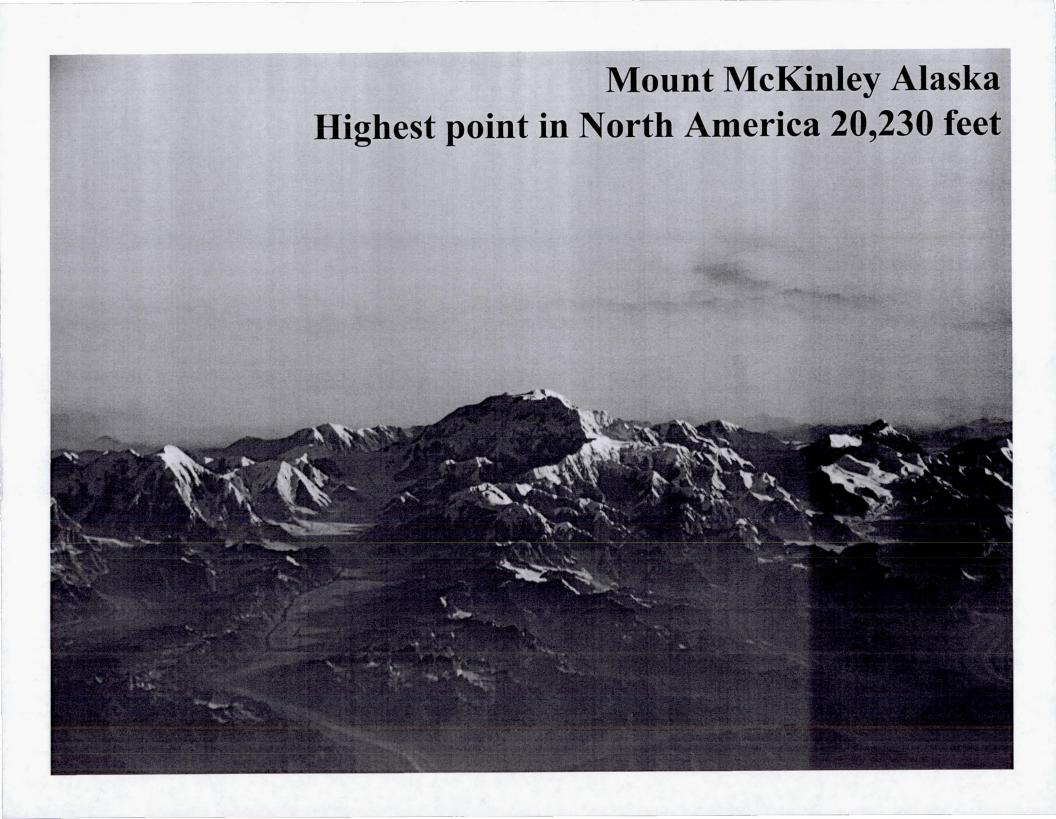


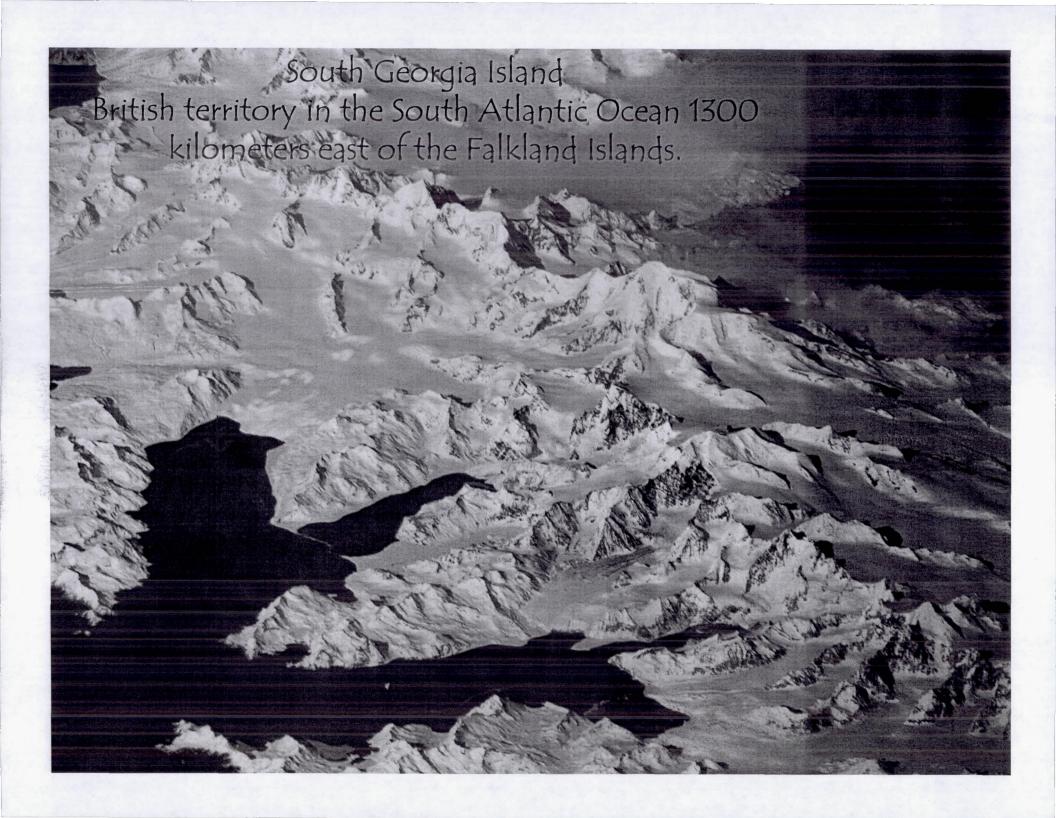


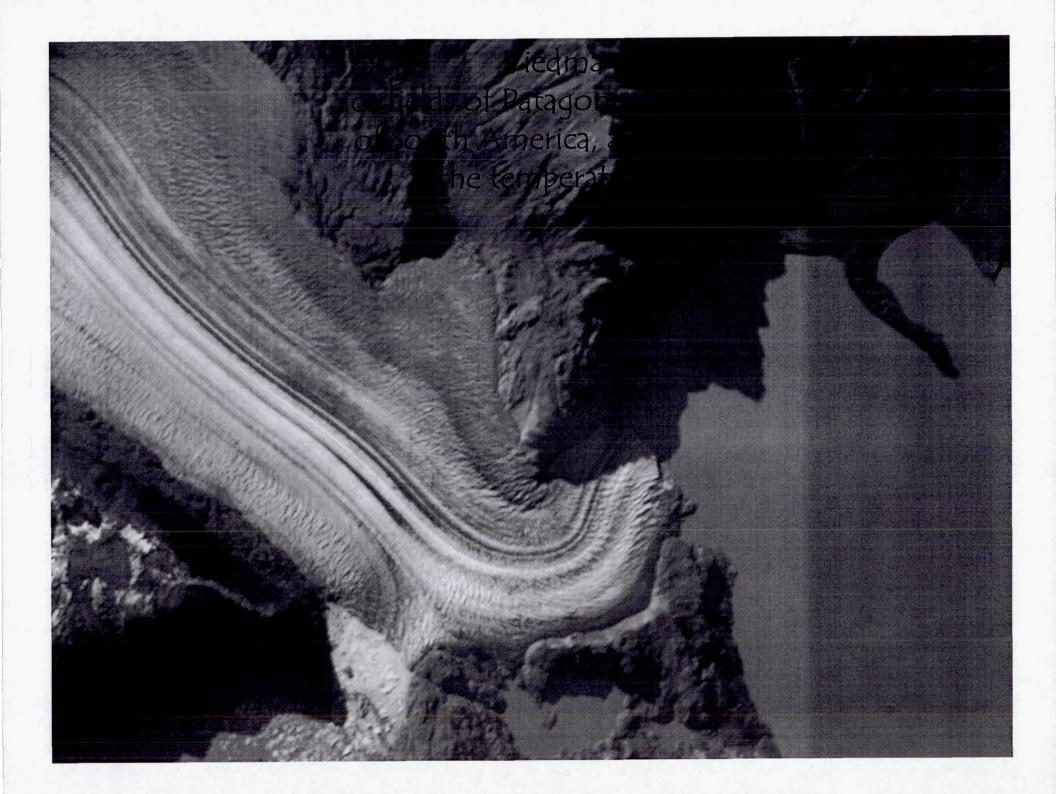


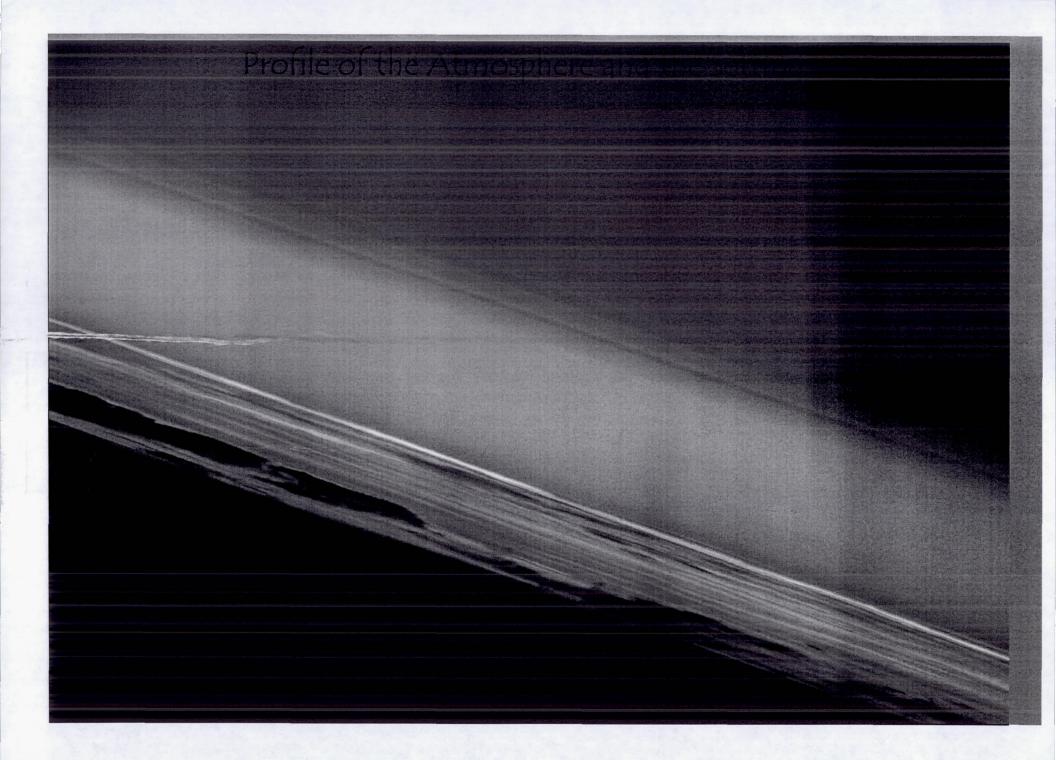


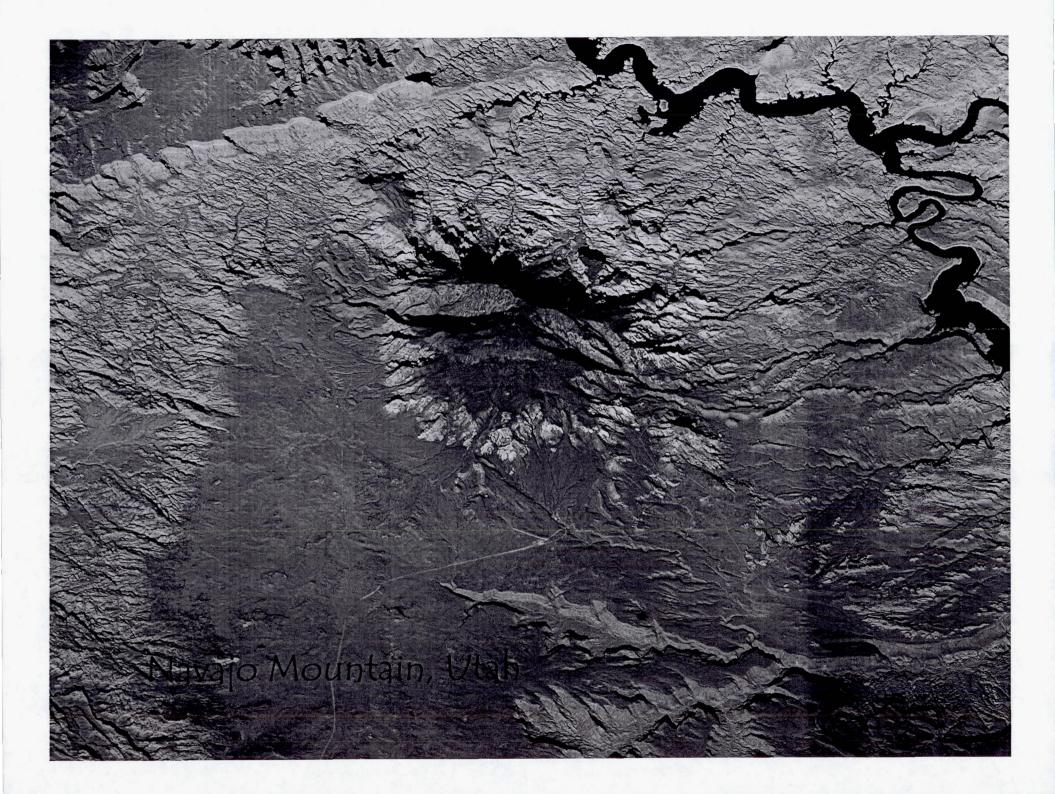


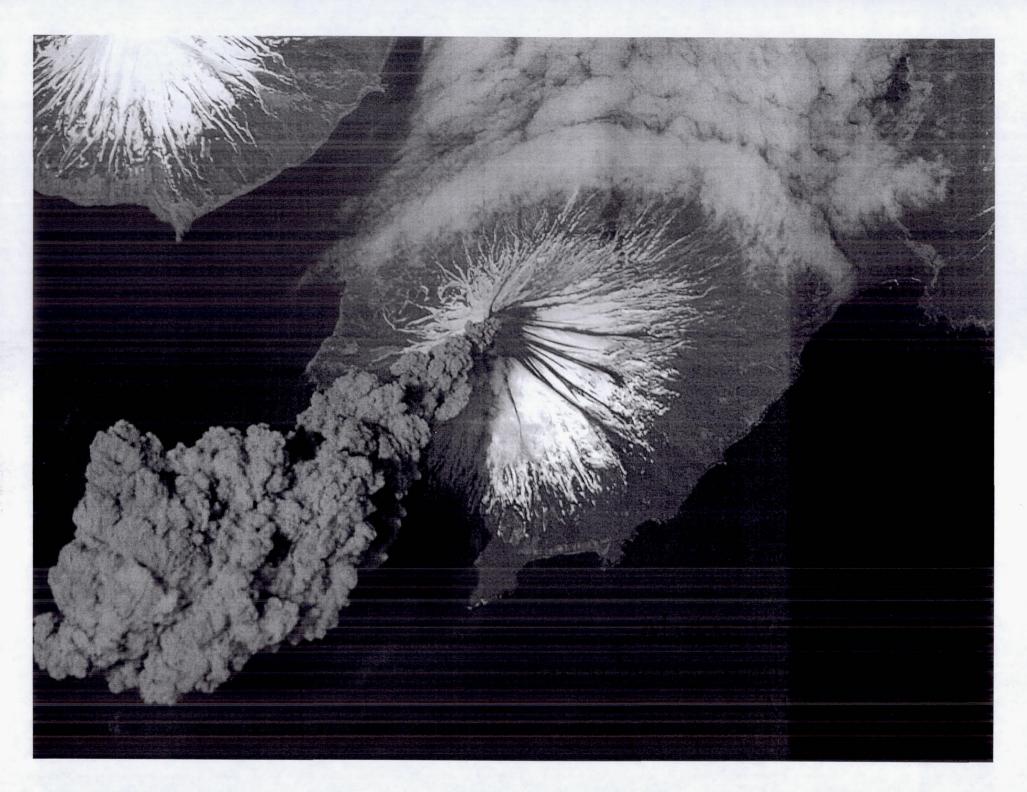


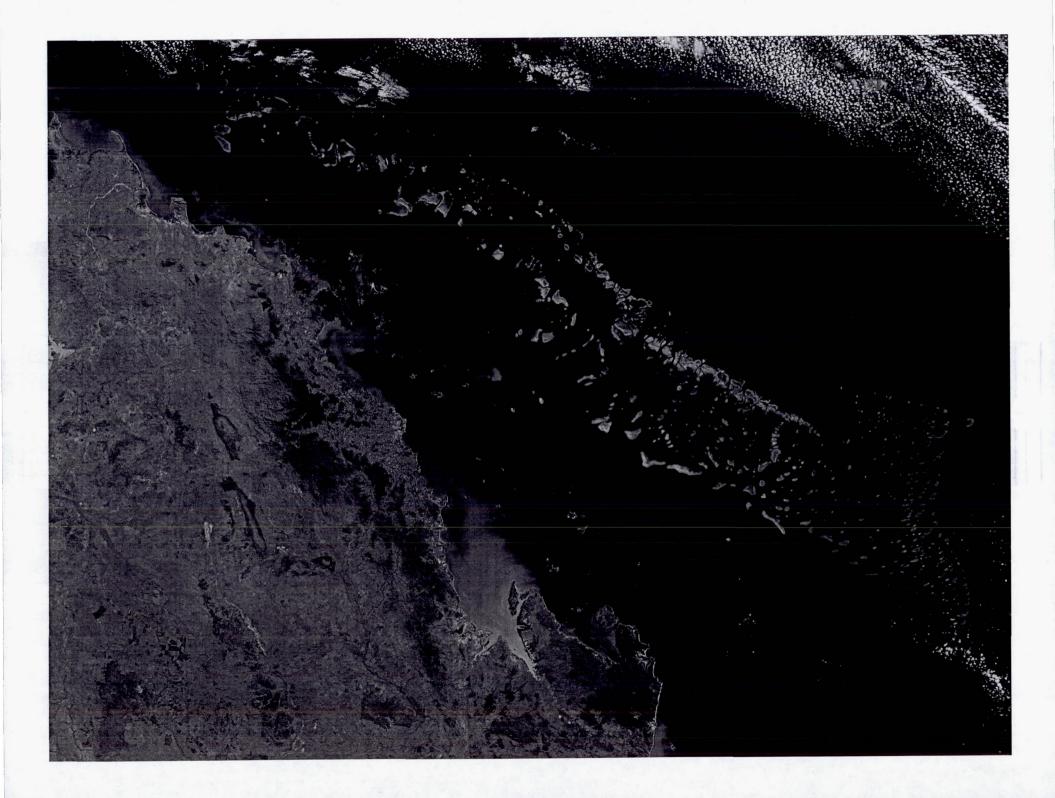


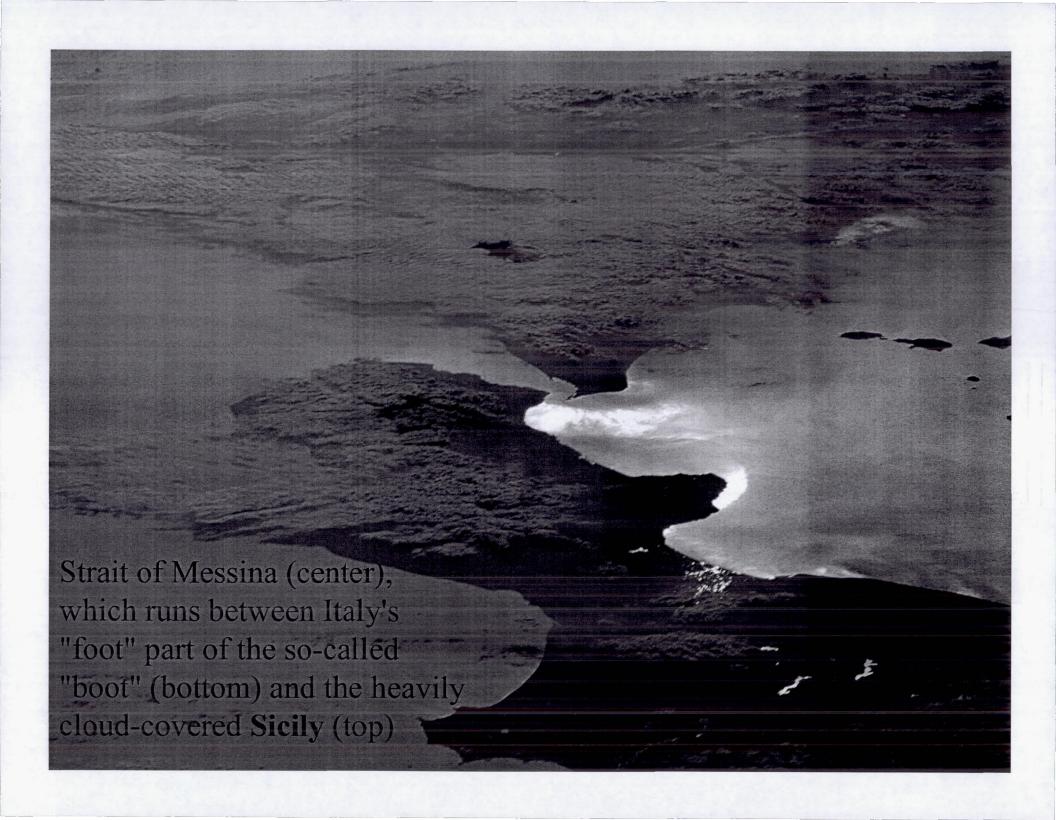


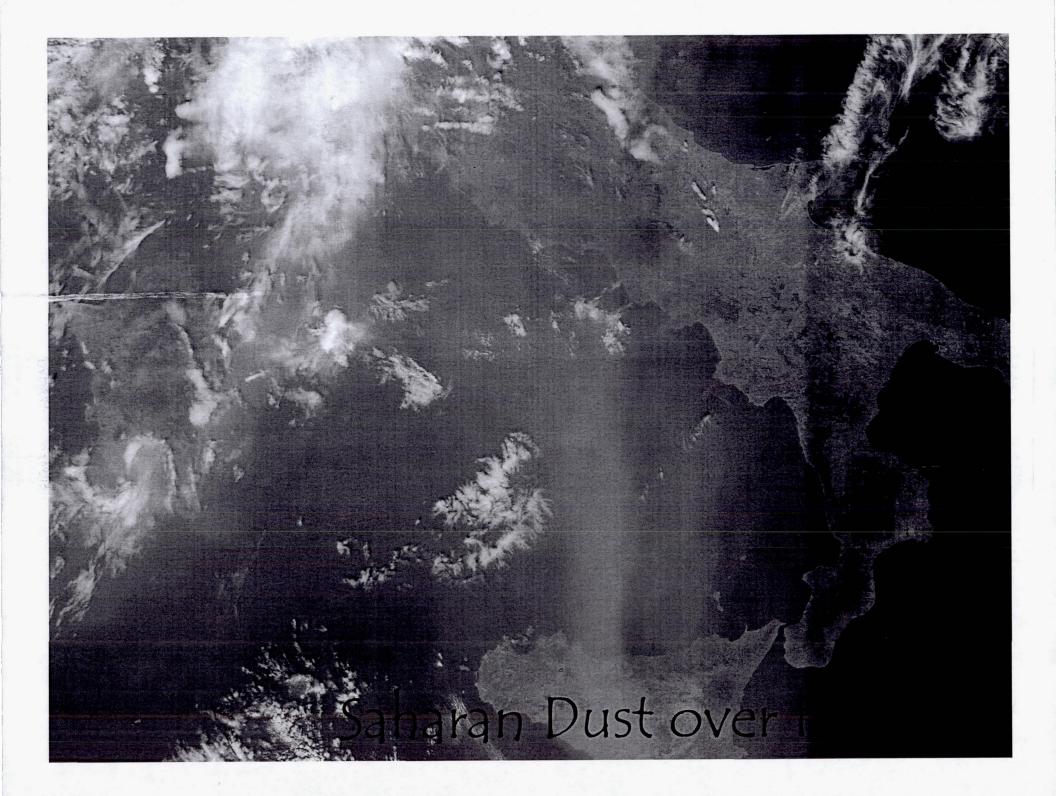


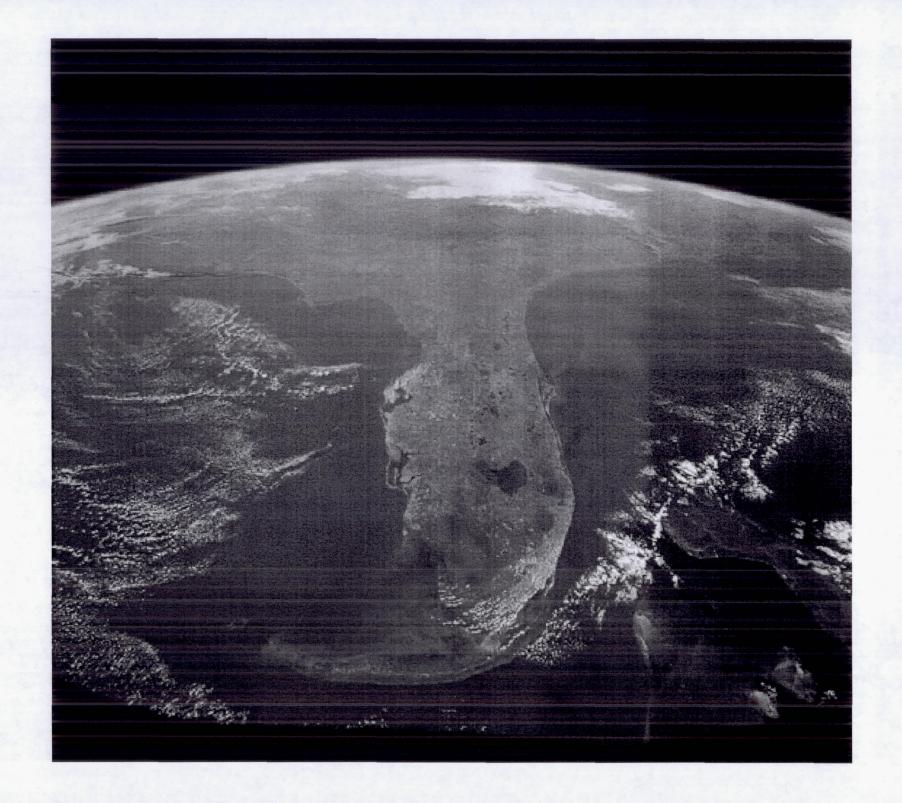


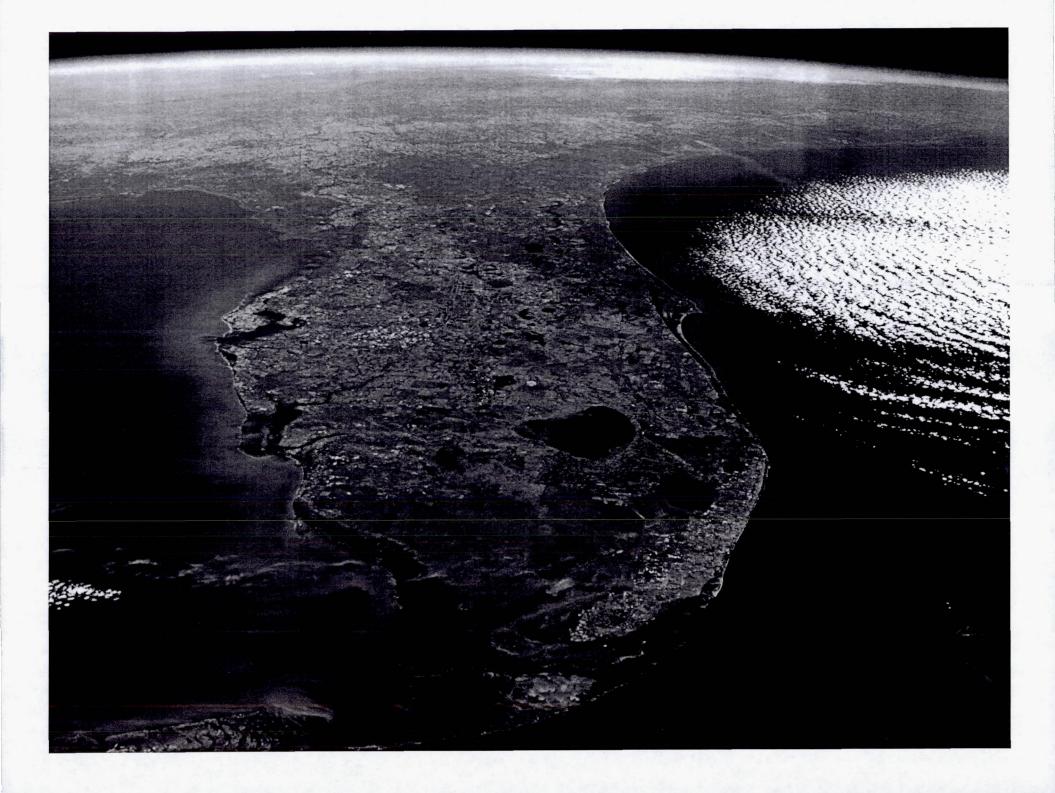






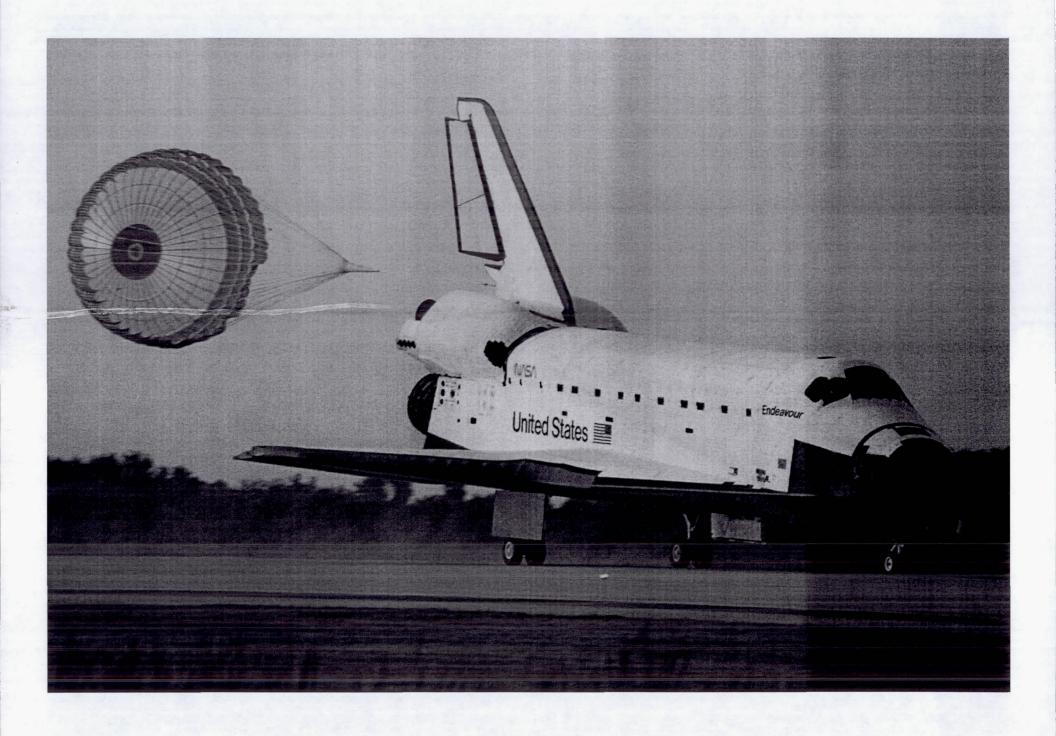




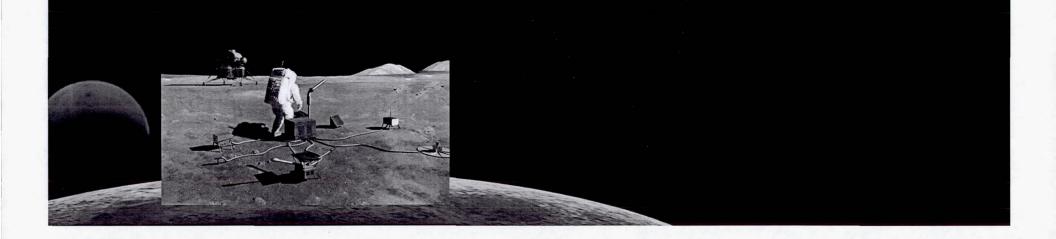


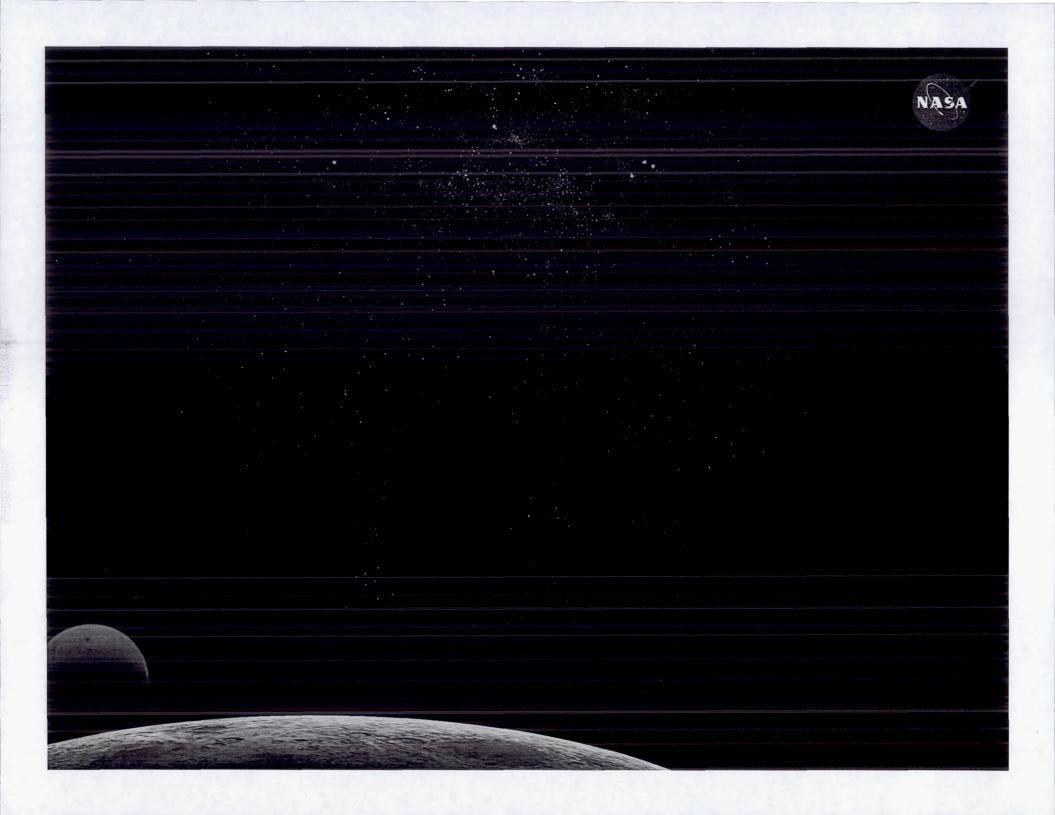












## **ISS Overview & Capabilities**

Wingspan End-to-End -- 361 feet (240 ft. today)

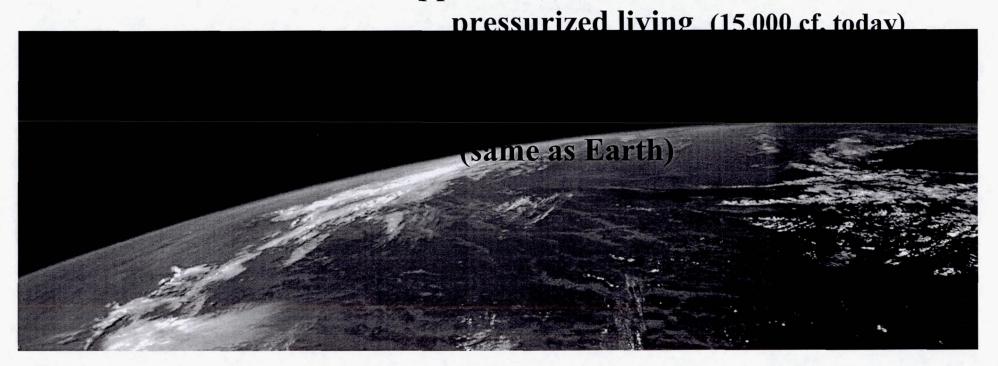
Operating Altitude -- 220 mile average

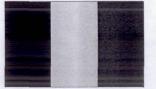
Length -- 290 feet (146 ft. today)

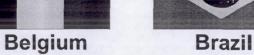
Weight -- Approx. 900,000 lbs. (500,000 lbs. today)

Inclination -- 51.6 degrees to the equator

Volume -- Approx 36,000 cubic feet of









**France** 



Spain



The Netherlands



Germany



Sweden



Japan



**Denmark** 



**Switzerland** 



Canada



Italy



Russia



**United Kingdom** 

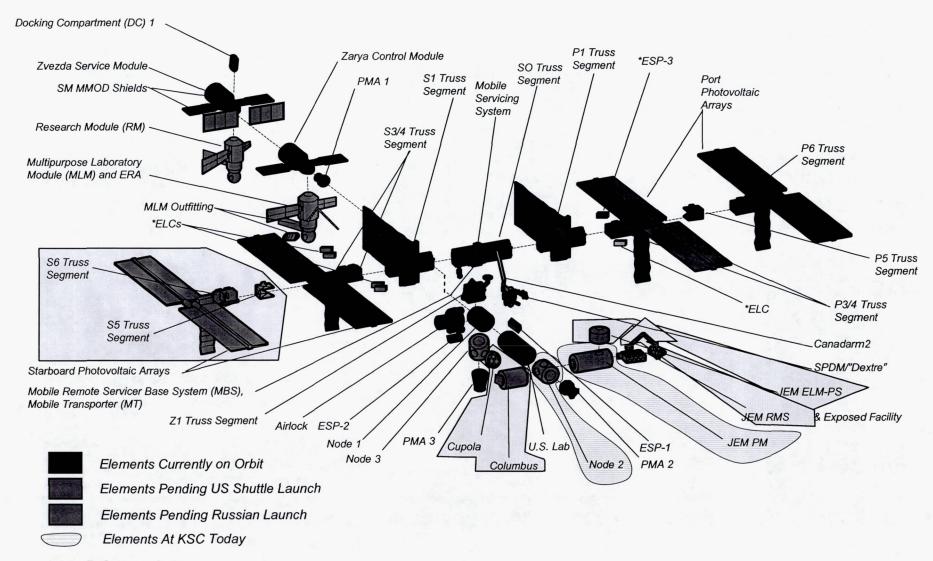


**United States** 



### **Proposed ISS Final Configuration**





<sup>\*</sup> For Reference Only



### 63 Flights to ISS (11/98-6/07)

### 21 USA

#### 21 shuttle flights

STS 88/2A U.S. Node STS 96/2A.1 Logistics STS 101/2a.2a Logistics STS 106/2B.2B Logistics STS 92/3A Z-1 Truss

STS 97/4A P6 Solar Array STS 98/5A Destiny Lab

STS 102/5A.1 MPLM, Expedition 2

STS 100/6A Canada Arm2 STS 104/7A U.S. Airlock

STS 105/7A.1 MPLM, Expedition 3

STS 108/UF1 Expedition 4

STS 110/8A SO Truss and Mobil Transport

STS 111/UF2 MBS, Science and Expedition 5

STS 112/ 9A S1 Truss, CETA Cart STS 113/11A P1 Truss, CETA Cart MPLM / ISS ORU's STS 121/ULF1.1 MPLM / ISS ORU's

**STS 115/12A P3/P4 Truss** 

STS 116/12A.1 P5 Truss- SpaceHab module

STS 117/13A 33/34 Truss

**42 Russian Flights** 

2 Proton Flights (Service Module and FGB)

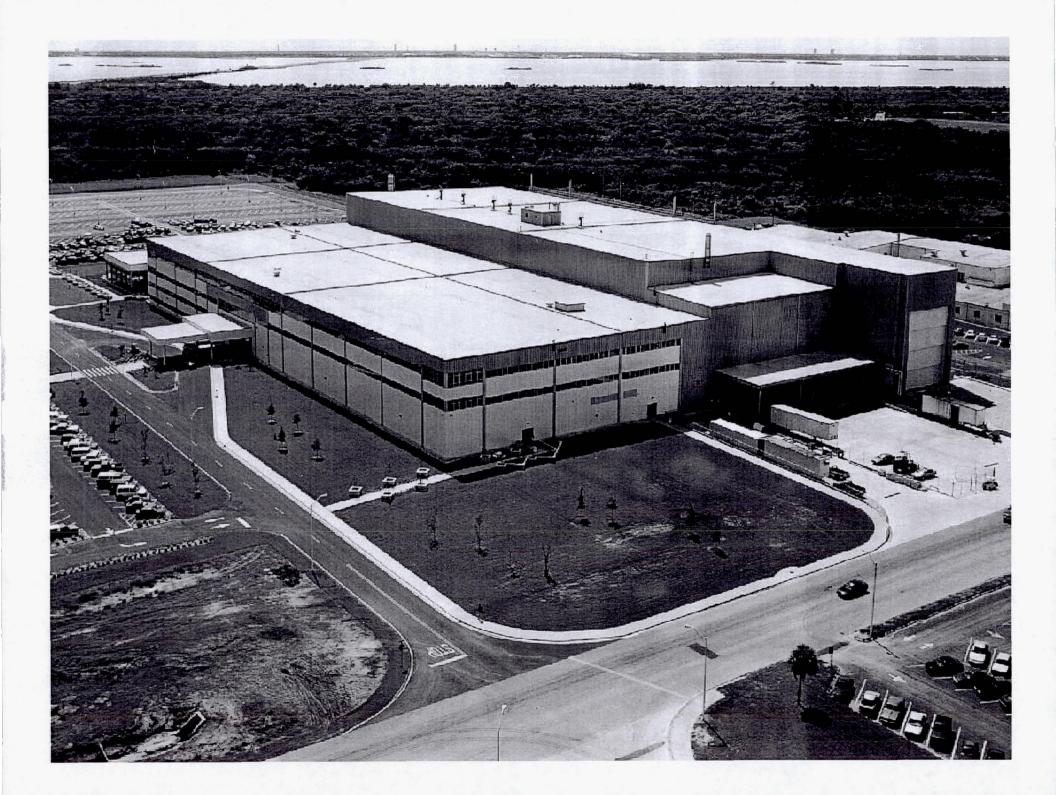
25 Progress Resupply Flights

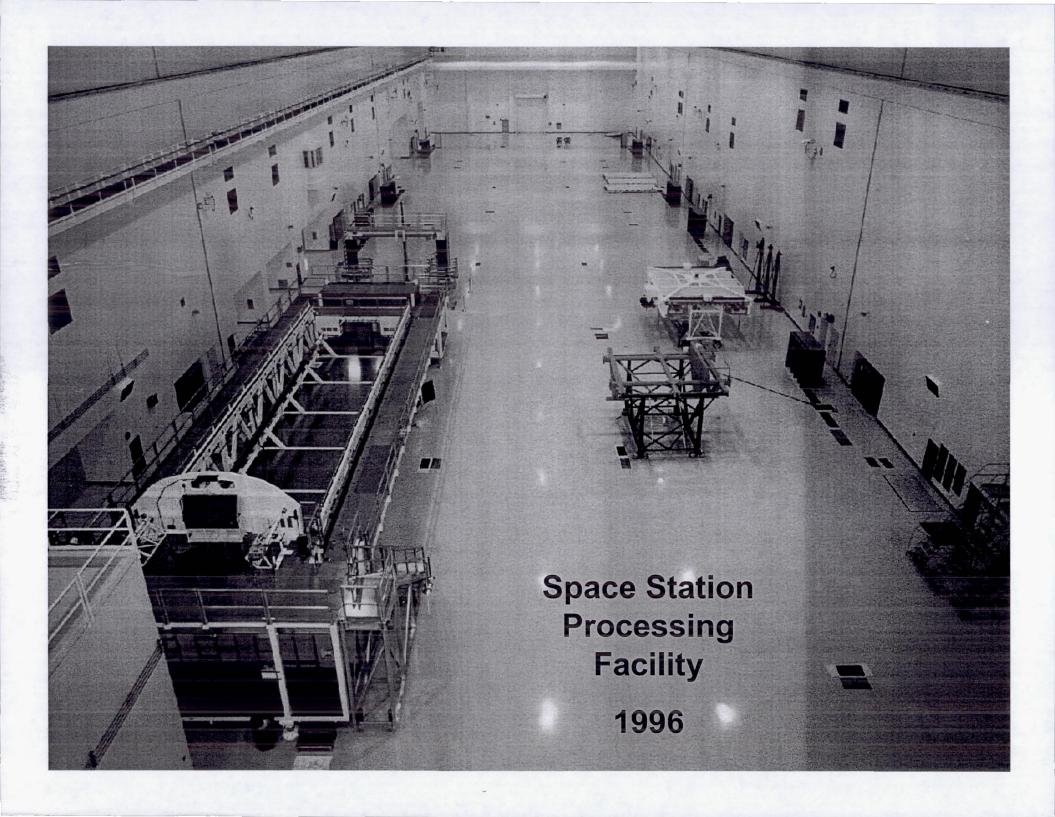
14 Manned Soyuz Crew Flights

1 Unmanned Soyuz, Docking Compartment Assembly Flight

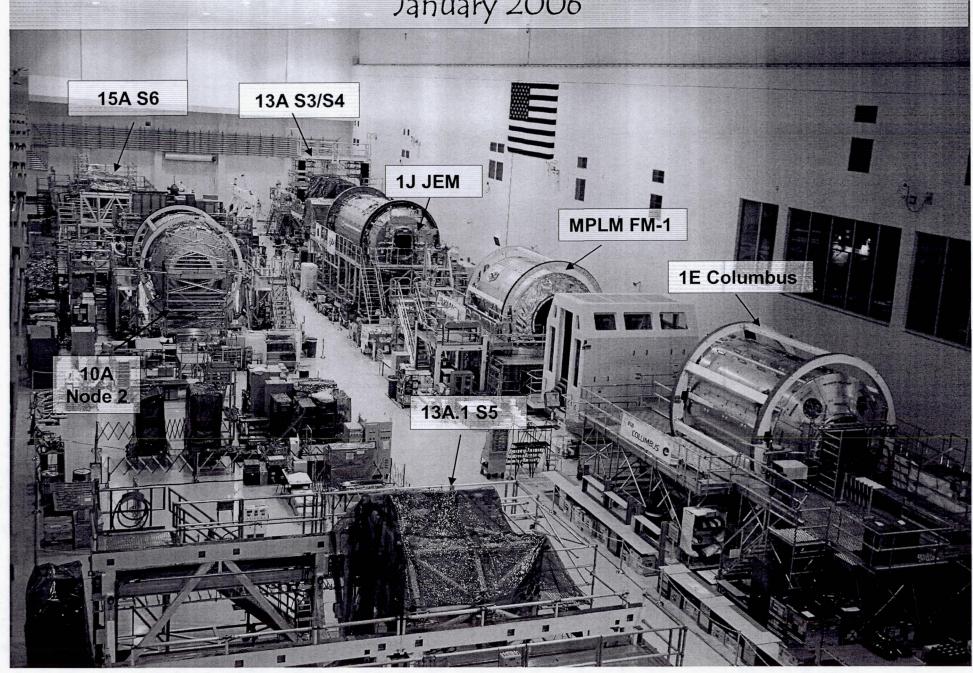




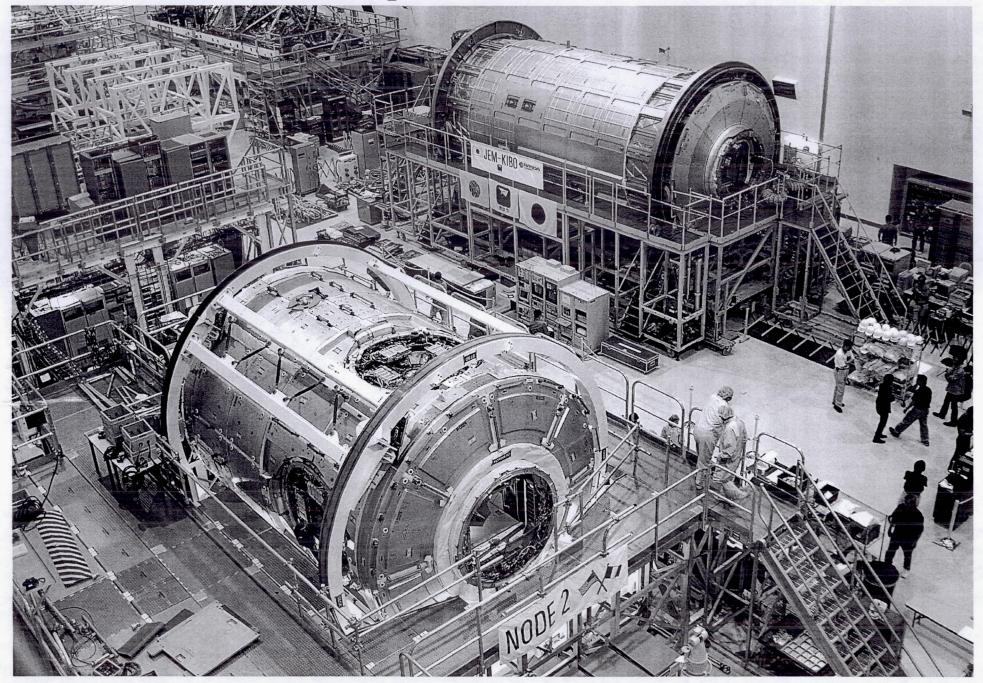




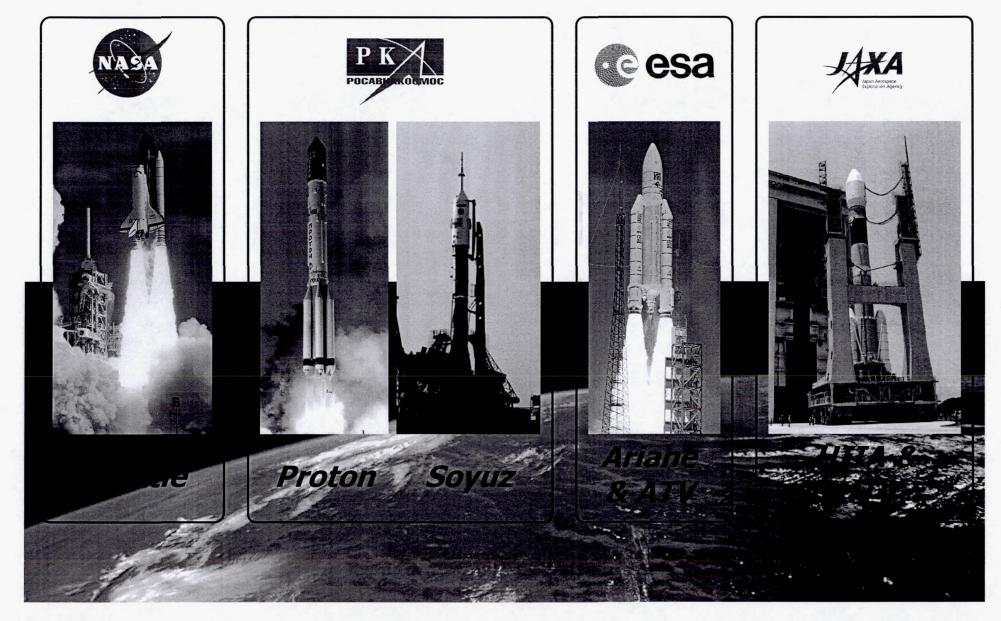
# Space Station Processing Facility January 2006

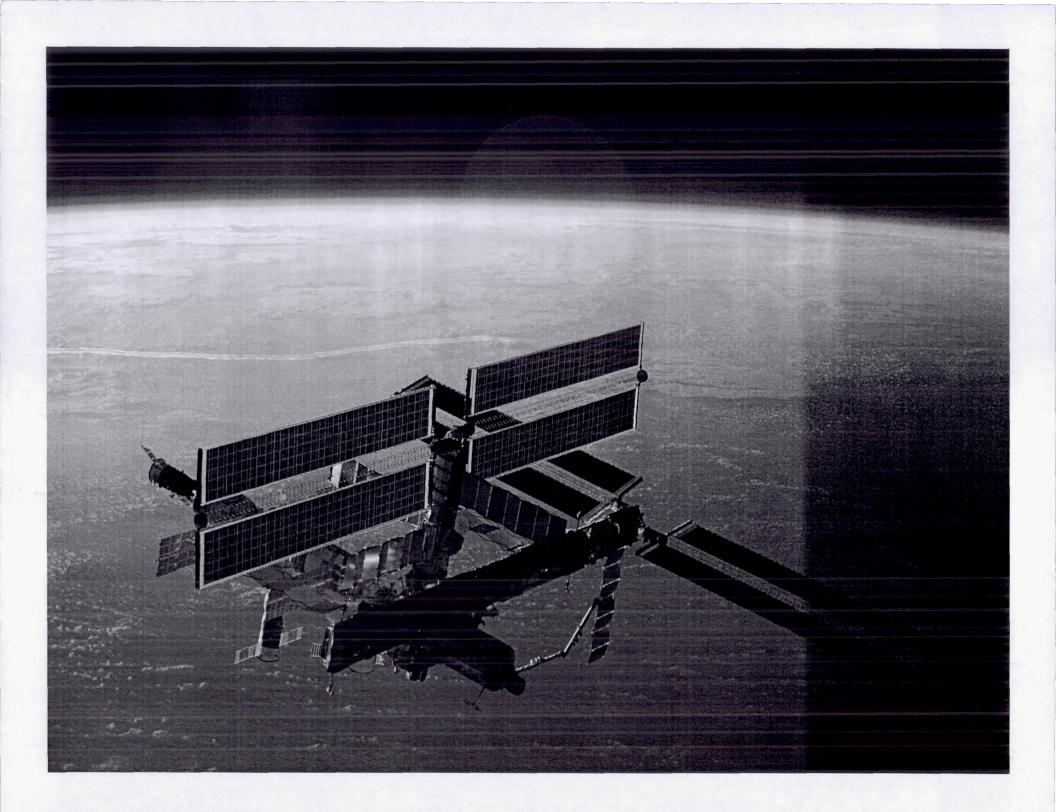


### **International Space Station Node 2 and JEM**

























# Fifteen Expeditions on Orbit



Expedition 9 Crew Fincke, Padalka

April 2004 – October 2004



Expedition 10 Crew Chiao, Sharipov.

October 2004 - April 2005

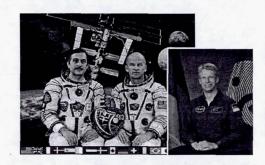


Expedition 11 Crew Phillips, Krikalev

April 2005- October 2005



Expedition 12 Crew
McArthur, Tokarev
October 2005– April 2006



Expedition 13 Crew Vinogradov,, Williams April 2006 – July 2006

Vinogradov, Williams, Reiter July 2006 – September 2006



Expedition 14 Crew Reiter, Lopez-Alegria, Tyurin October 2006 – December 2006

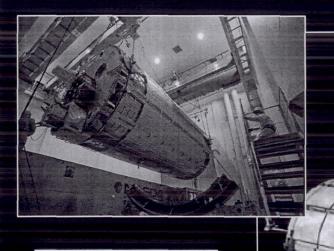
Williams, Lopez-Alegria, Tyurin December 2006 – April 2007



Expedition 15 Crew Williams, , Yurchikhin, Kotov April 2006 – December 2006

Anderson, Yurchikhin, Kotov December 2006 – April 2007 Soyuz TMA-8 Capsule Landing Expedition 13 September 29, 2006 Kazakhstan, Russia



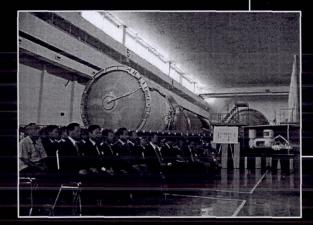


Experiment Logistics
, Module-Pressurized Section
(ELM-PS)

Remote Manipulator System (JEMRMS)

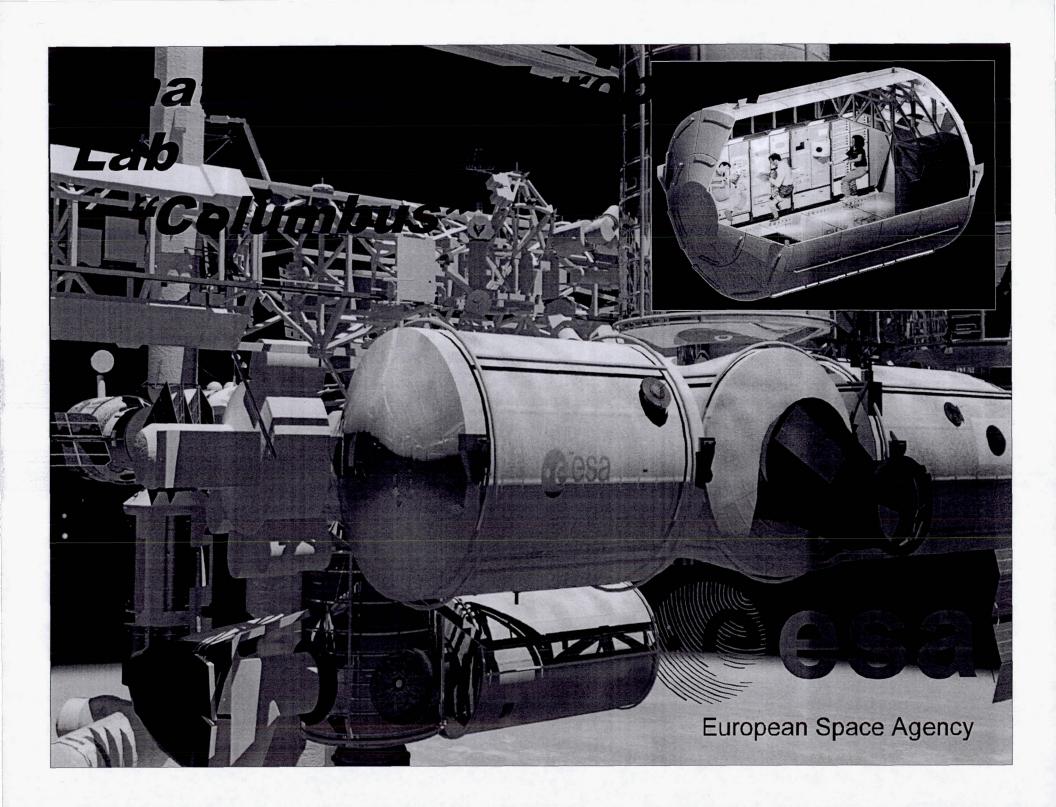


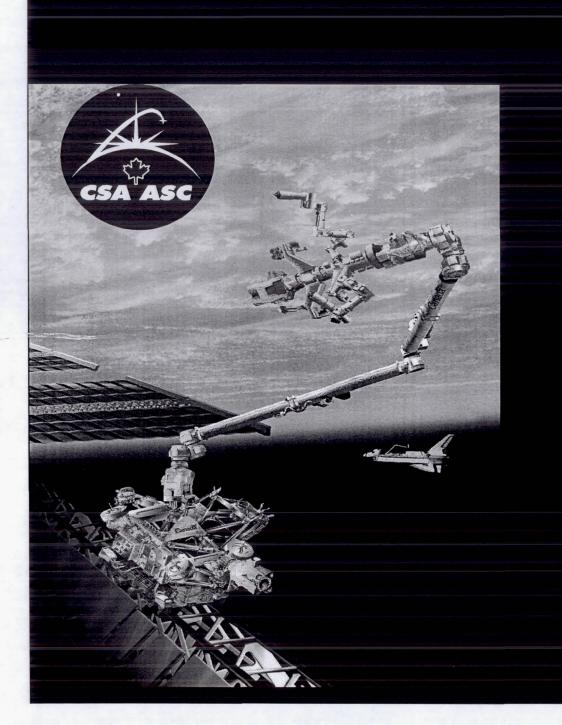
Pressurized Module (PM)



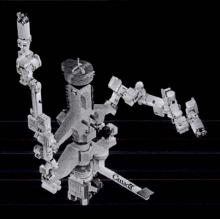
Exposed Facility (EF)

Experiment Logistics Module-Exposed Section (ELM-ES)



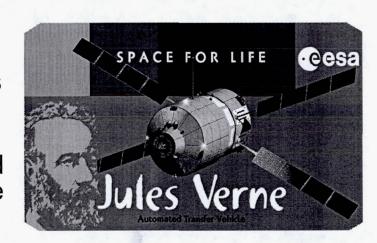


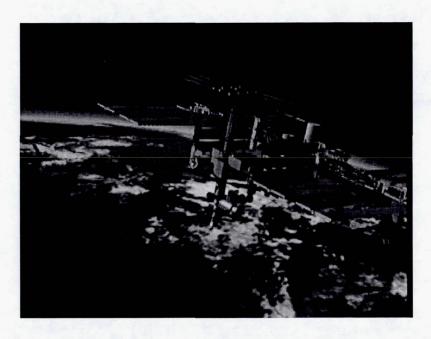
- Special Purpose Dexterous Manipulator
- Remote Manipulator manufacturing completed and accepted by 05A



#### The Automated Transfer Vehicle

- ISS depends on regular deliveries of experimental equipment and spare parts as well as food, air and water for its permanent crew.
- From 2007 onward, Europe's Automated Transfer Vehicle (ATV) will be one of the indispensable ISS supply spaceships

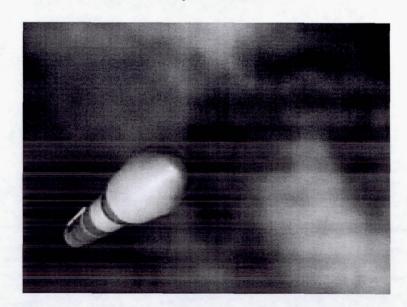




- Every 12 months or so, the unmanned ATV will haul 7.5 tons of cargo from its Kourou launch site in French Guiana to the Station
- Automatically dock with the Station's Russian service module
- The ATV will remain there as a pressurized and integral part of the Station for up to six months until its final mission: a fiery one-way trip into the Earth's atmosphere to dispose of up to 6.5 tons of Station waste.

#### The H-II Transfer Vehicle

- Japan's transfer vehicle is called the H-II Transfer Vehicle (HTV)
- The HTV is an unmanned orbital carrier, designed to deliver up to six tons of goods to the ISS in orbit at an altitude of about 400 kilometers and return with spent equipment, used clothing, and other waste materials on the return trip
- These waste materials will be incinerated when HTV makes re-entry into the atmosphere.



# The system uses Japan's H2 launch vehicle



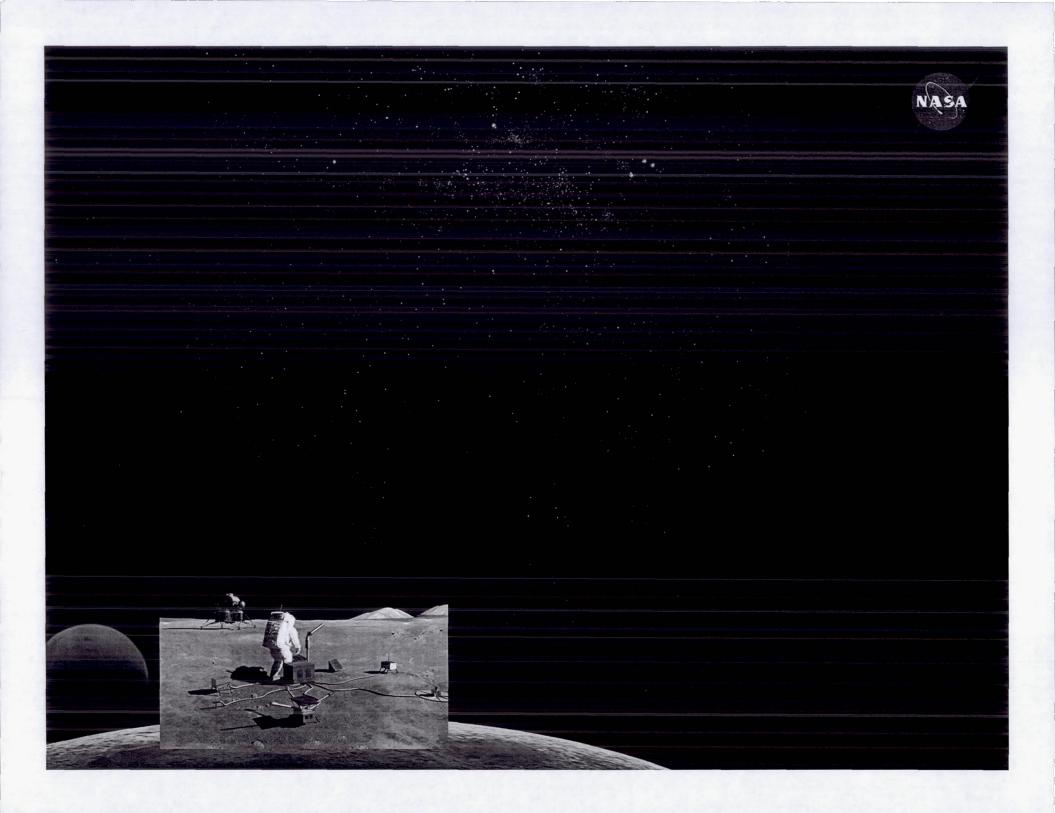
 HTV has 2 types of logistics carrier: pressurized section where crewmembers can work when HTV is being berthed to the ISS; and unpressurized section that accommodates Kibo's Exposed Facility payloads on an Exposed Pallet

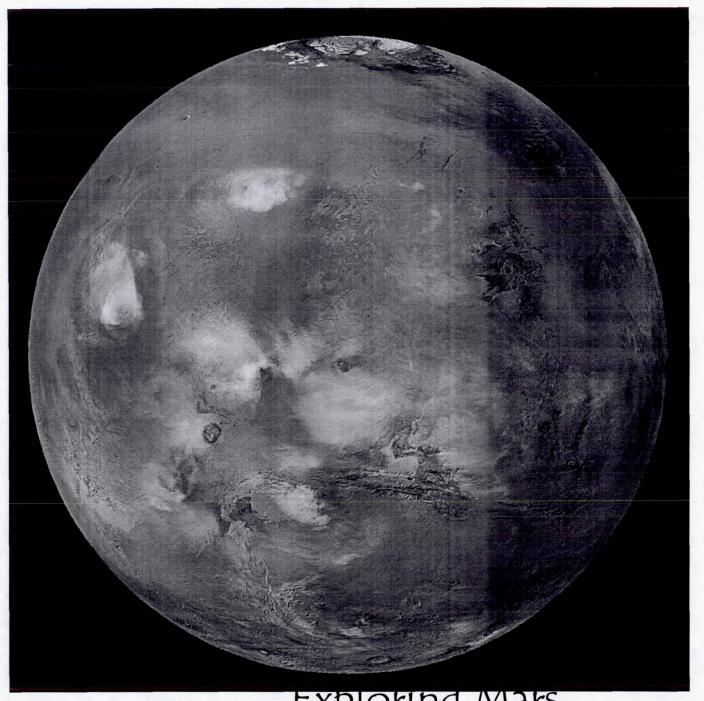


### **Projected Launch Schedule**



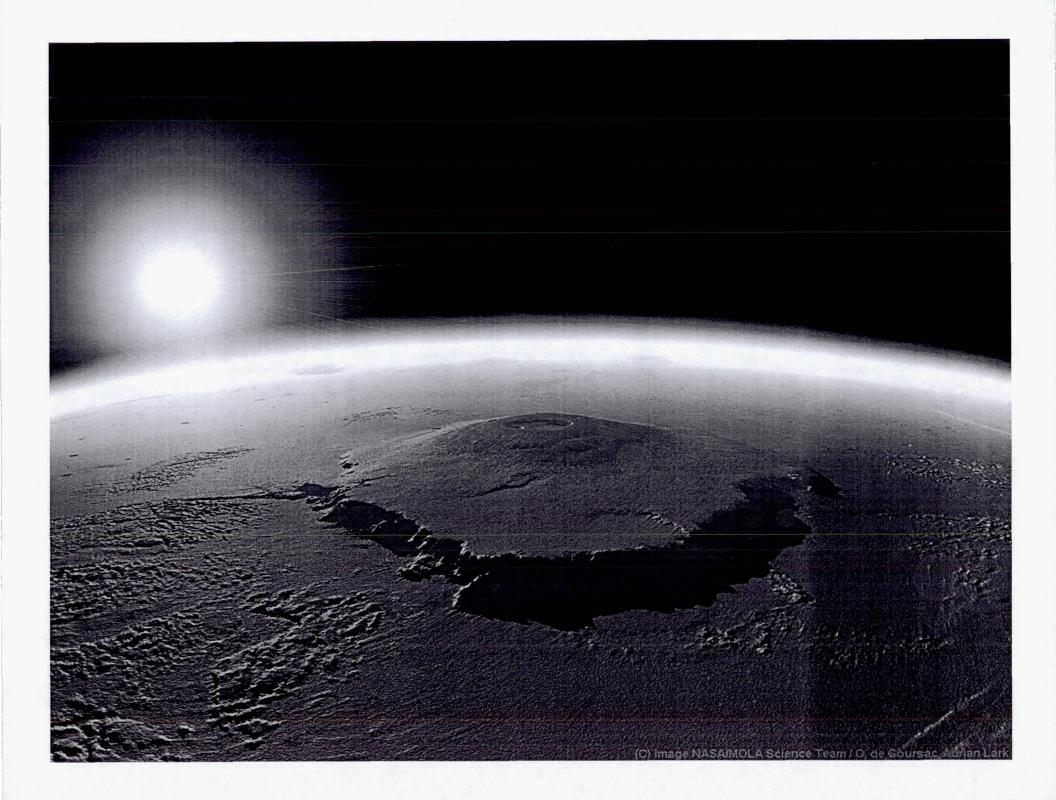
2008 2007	2008	2009	2010
ULF1.1 / STS-121 MPLM Jul. 4, 2006	HST ST Sep. 10		ULF 4 /STS-131 Jan. 28 2010
12A / STS-115 P3/4 Sep. 9, 2006 12A.1 / STS-116	/ MPI		STS-132 ELC 4 2010
P5; SpaceHab Dec. 7, 2006  13A / STS- \$3/\$4 Jun. 8, 200	JEM FE: EL	Jan. 15 2009 20A/ST3 NODE 3 Jun. 10	w/Cupola /
	STS-118 aceHab	17A STS-128 MPLM Jun. 30 2009	HTV-2 Jul. 2010
/_\ NO	A / STS-120 DE 2 t. 20, 2007		STS-129
	TV1 lov. 2007	SEP.	1, ELC 2 11 2009
	1E / STS-122 Columbus Dec. 6, 2007		ATV2 NOV. 2009
	1J/A / STS-123 ELM PS <i>SPDM</i> Feb. 14, 2008		19A STS-130 MPLM NOV. 19 2009
Black Text = Currently at KSC Red Text = Yet to be Delivered	1J / STS-124 JEM PM Apr. 24, 2008		3R MLM Dec. 09

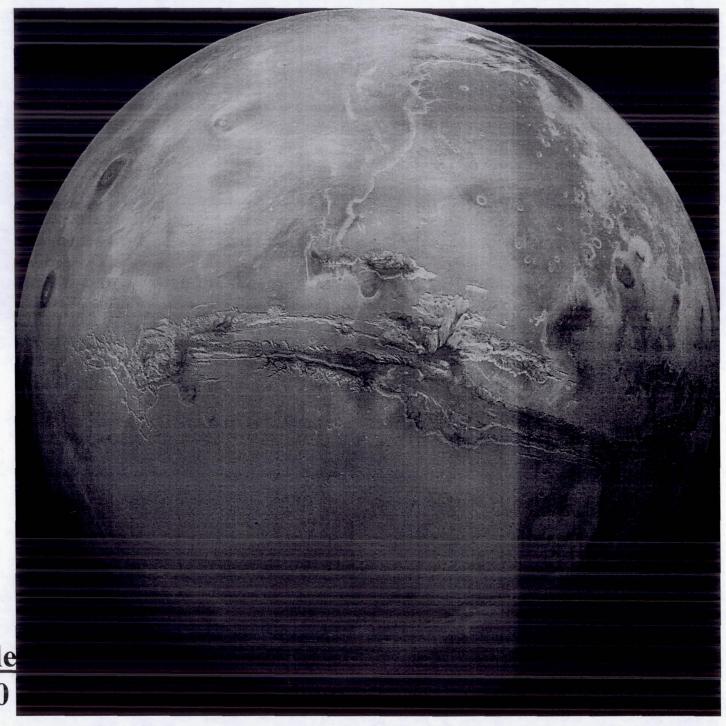




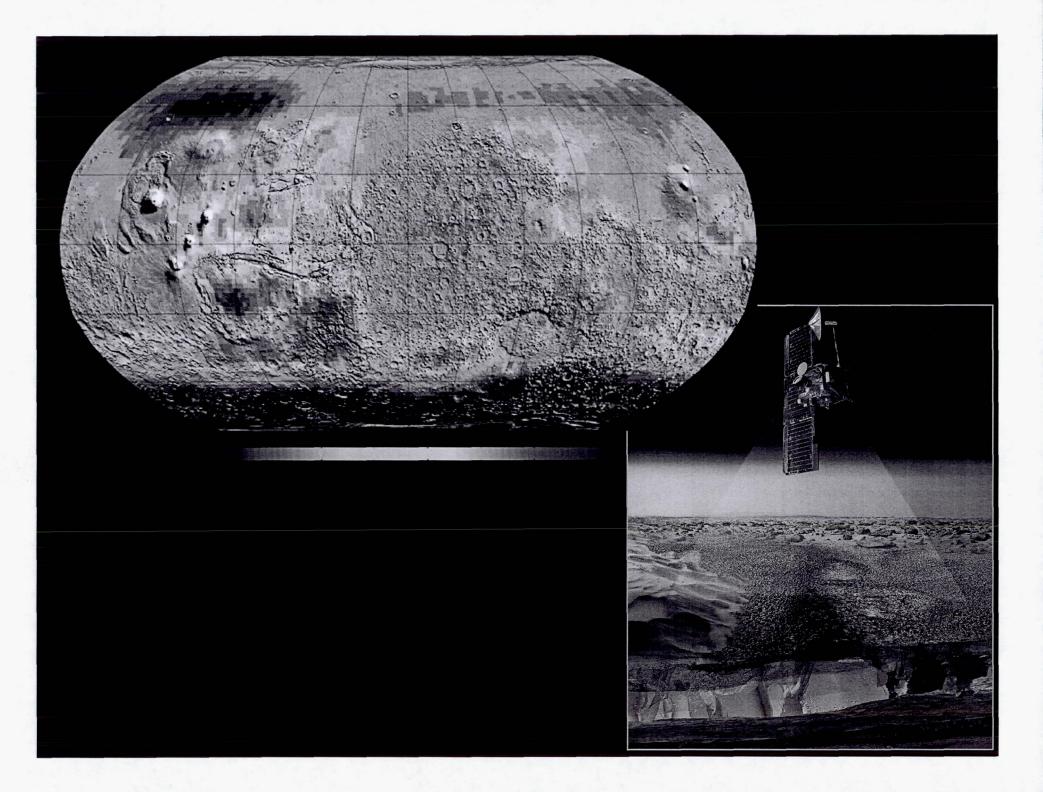
Exploring Mars

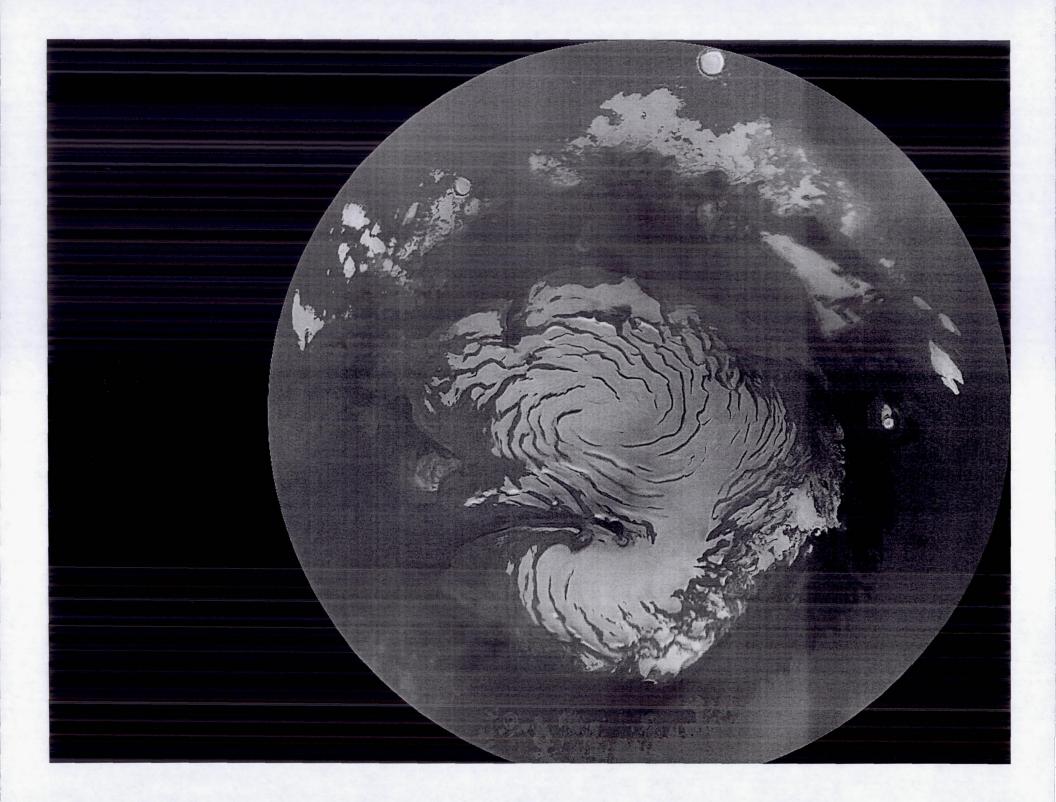






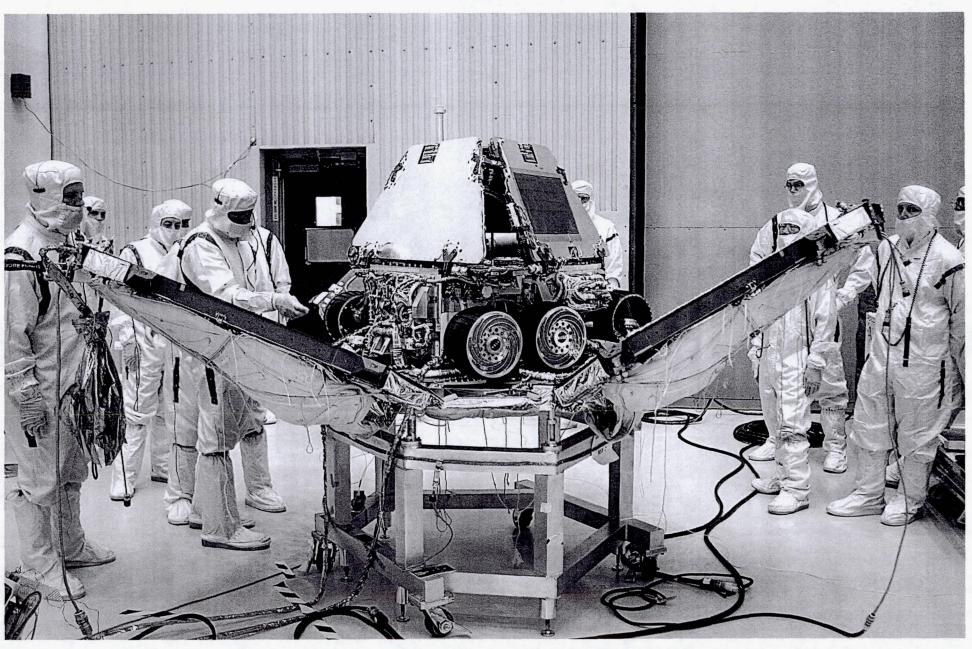
**Valle 2500** 



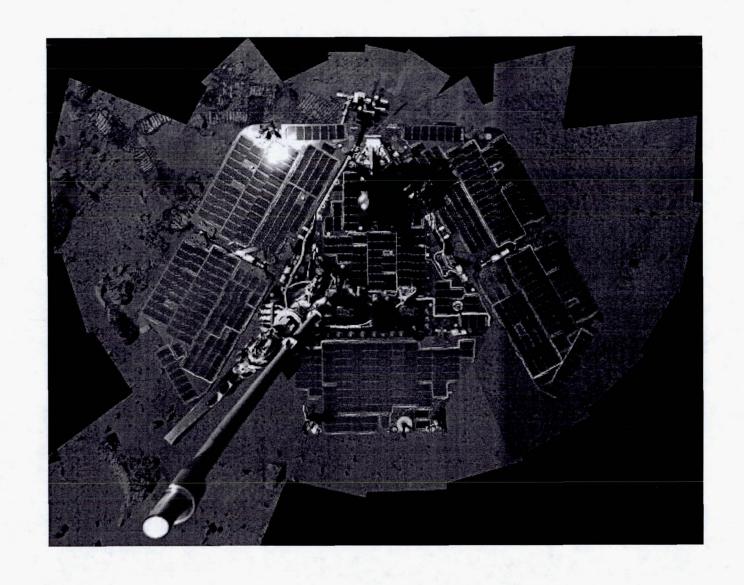


## Mars Exploration Rover at KSC

April 2003







Self-portrait of NASA's Mars Exploration Rover Spirit August 2005



Opportunity Lander

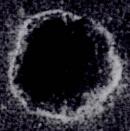
 $\odot$ 

**Backshell & Parachute** 

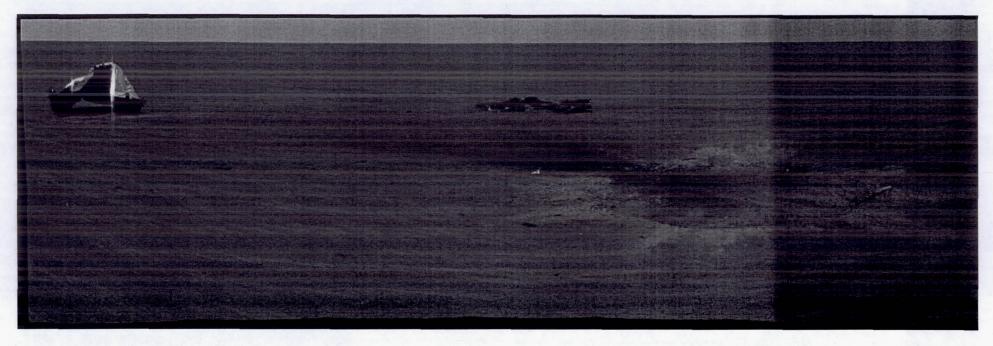
41



"First Bounce" and Effects of Rocket Firing



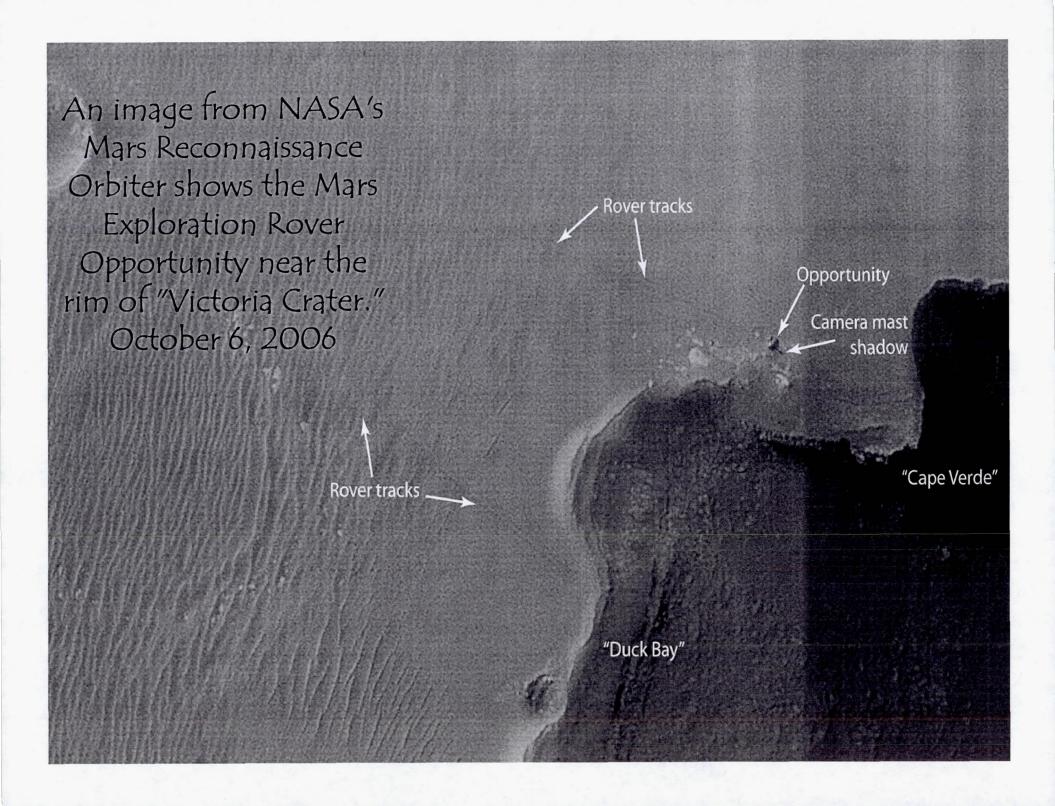
**Heatshield Impact Site** 



Heat shield impact site of NASA's Mars Exploration Rover Opportunity.

Mosaic was acquired on Opportunity's sol 330 (Dec. 28, 2004)

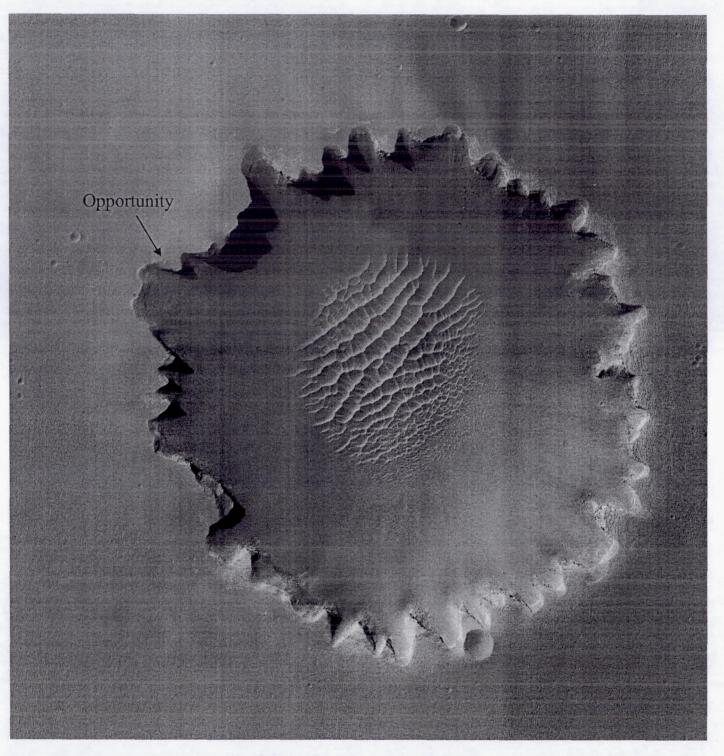
On the left, the main heat shield piece is inverted and reveals its metallic insulation layer, glinting in the sunlight. The main piece stands about 1 meter tall (about 3.3 feet) and about 13 meters (about 43 feet) from the rover.

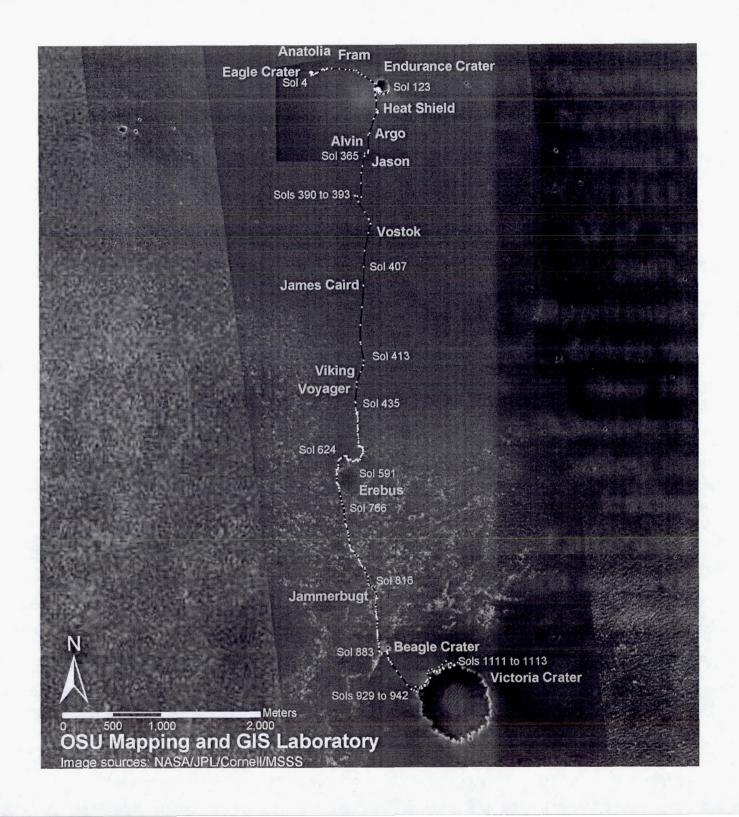


High Resolution
Imaging Science
Experiment on
NASA's Mars
Reconnaissance
Orbiter

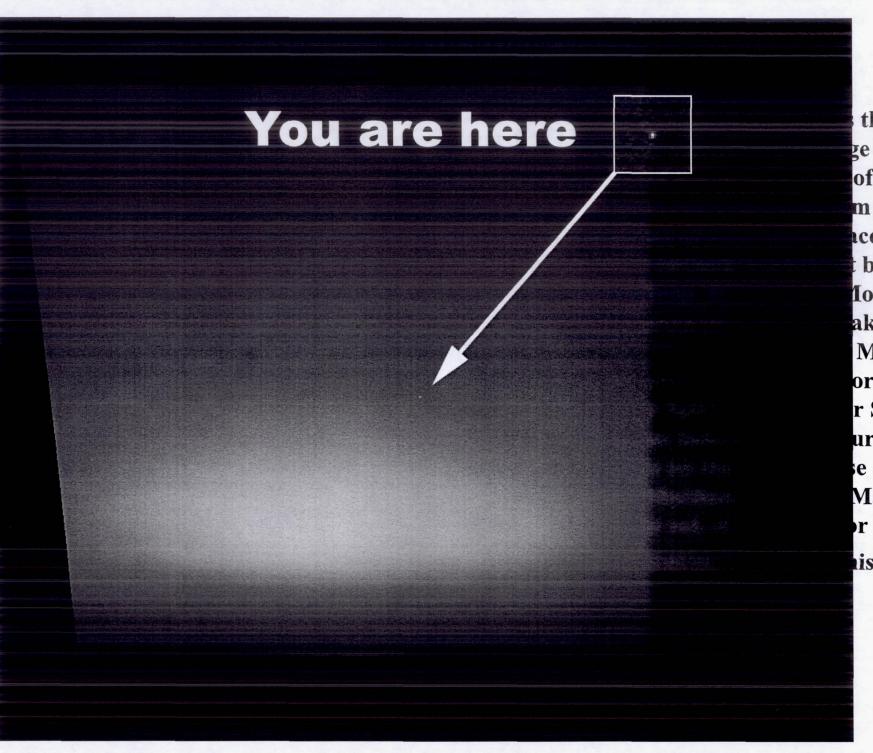
October 6, 2006

Victoria crater," an impact crater at Meridiani Planum, near the equator of Mars ½ mile in diameter





**Opportunity's** traverse map through Sol 1113 As of April 2007, Opportunity has driven more than 10.5 kilometers (6.5 miles) since leaving **Endurance** and is approaching Victoria.



the first ge ever of Earth m the ace of a beyond Ioon. It aken by Mars oration r Spirit ur before e on the Martian r sol, of ission.

Mars Exploration Rover Spirit panoramic camera, shows the rover's destination toward the hills nicknamed the "Columbia Hills."

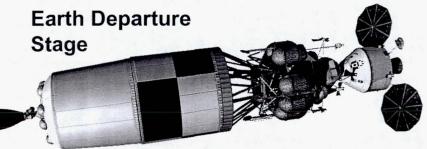


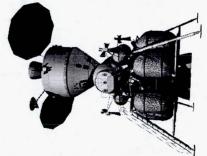




## Components of Program Constellation

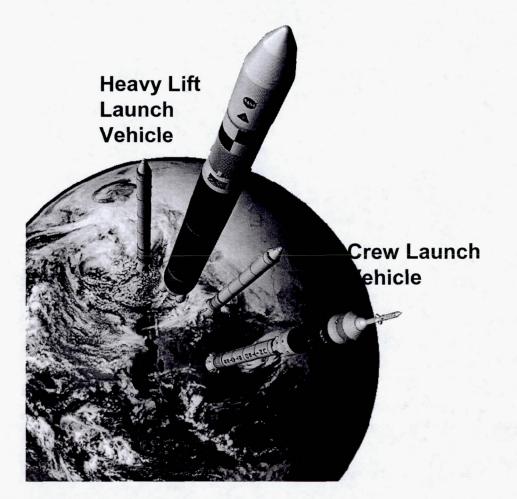






Orion - Crew Exploration Vehicle







# **Heritage Derived Launch Vehicles**

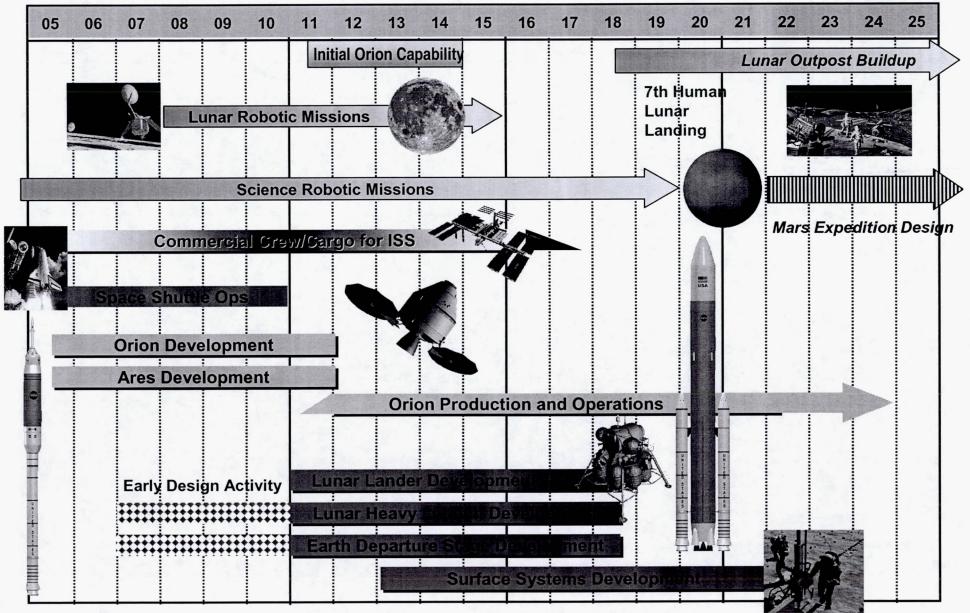




### NASA's Exploration Roadmap



1st Human Orion Flight

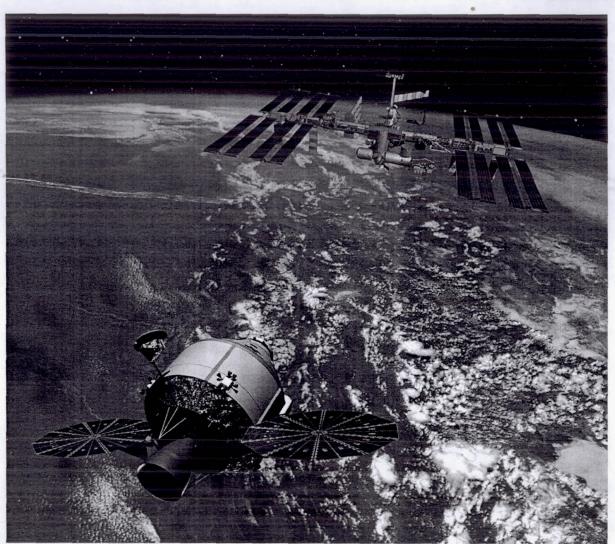




# Orion Capable of Supporting Space Station Missions



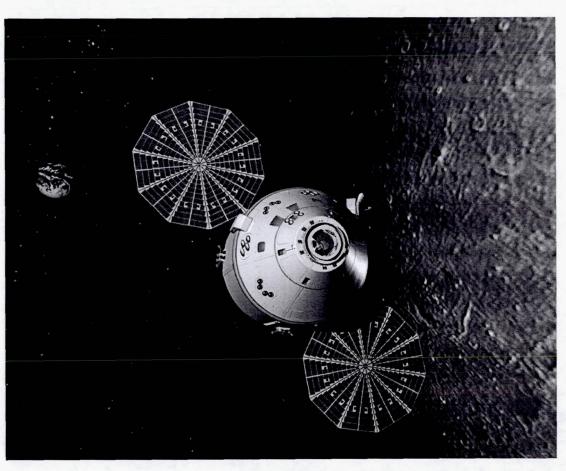
- Transport up to 6 crew members on Orion for crew rotation
- 210 day stay time
- Emergency lifeboat for entire ISS crew
- Deliver pressurized cargo for ISS resupply



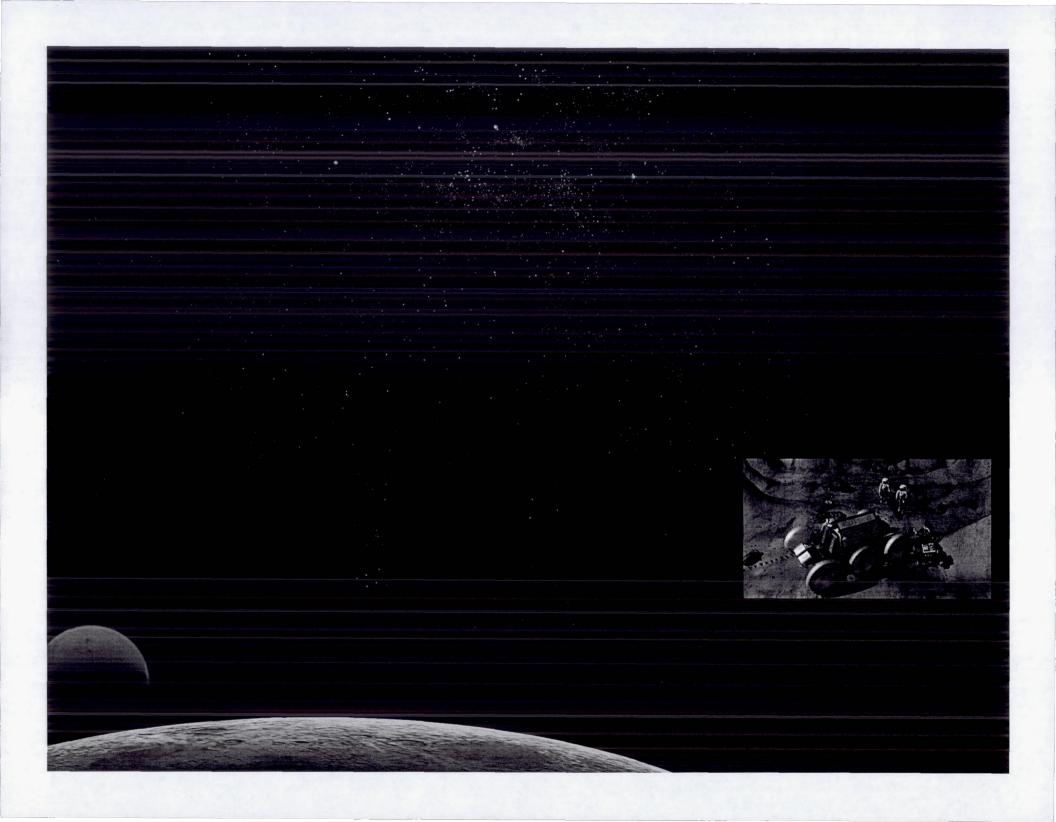


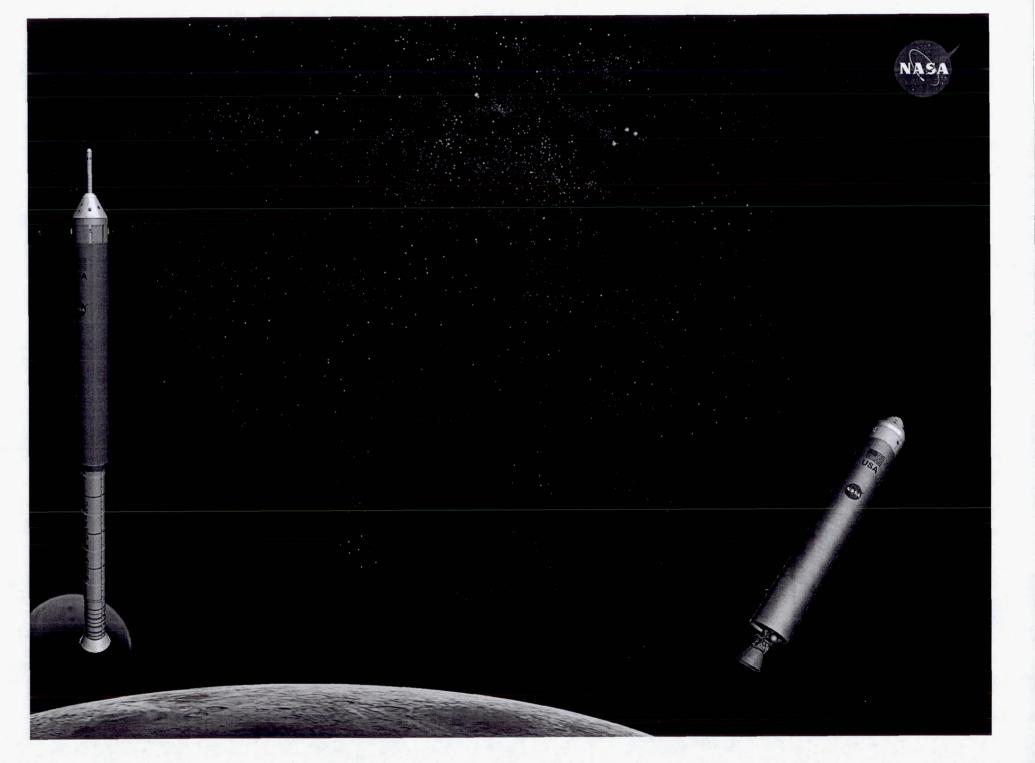
#### **Orion Lunar Mission**





- Orion and Lunar Lander boosted to lunar orbit
  - Up to 4 crew onboard
- Lander descends to lunar surface for up to 7 day sortie
- Orion is uninhabited during lunar surface operations
- Lander upper stage returns to Orion in lunar orbit
- Orion returns crew to Earth







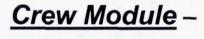
### Orion System Elements



Orion consists of four functional modules

Launch Abort System --

emergency escape during launch



crew and cargo transport

Service Module -

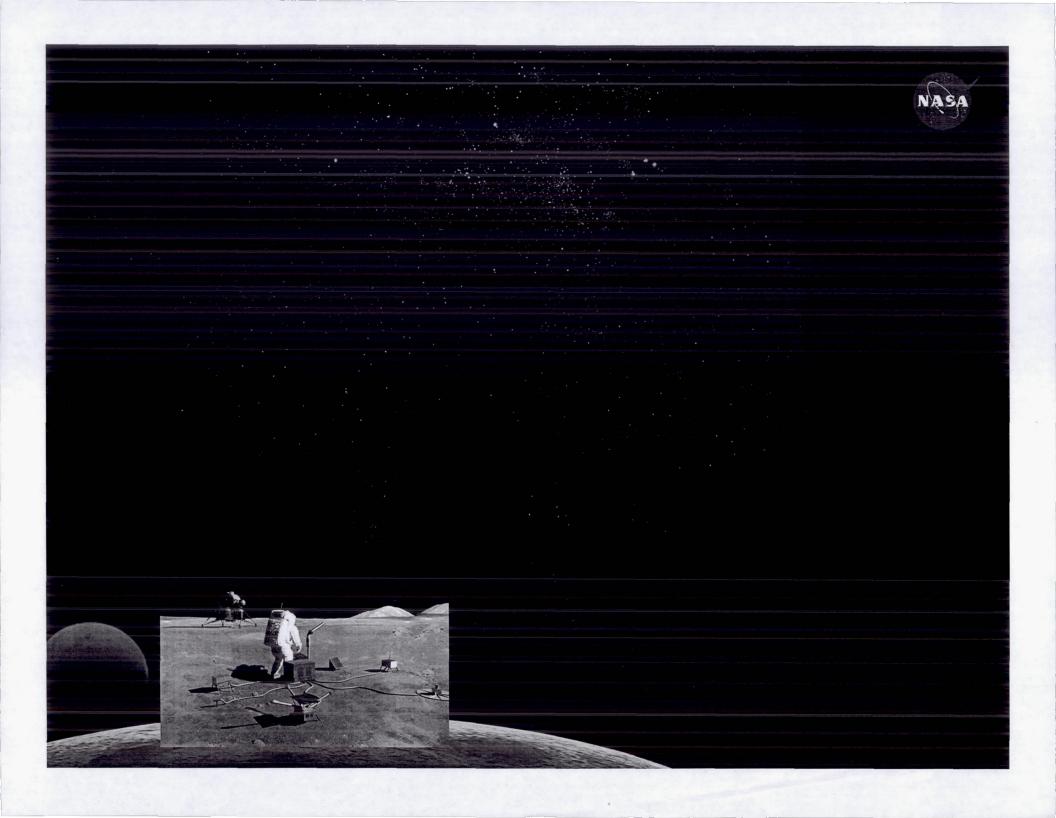
propulsion, electrical power, fluids storage

Spacecraft Adapter -

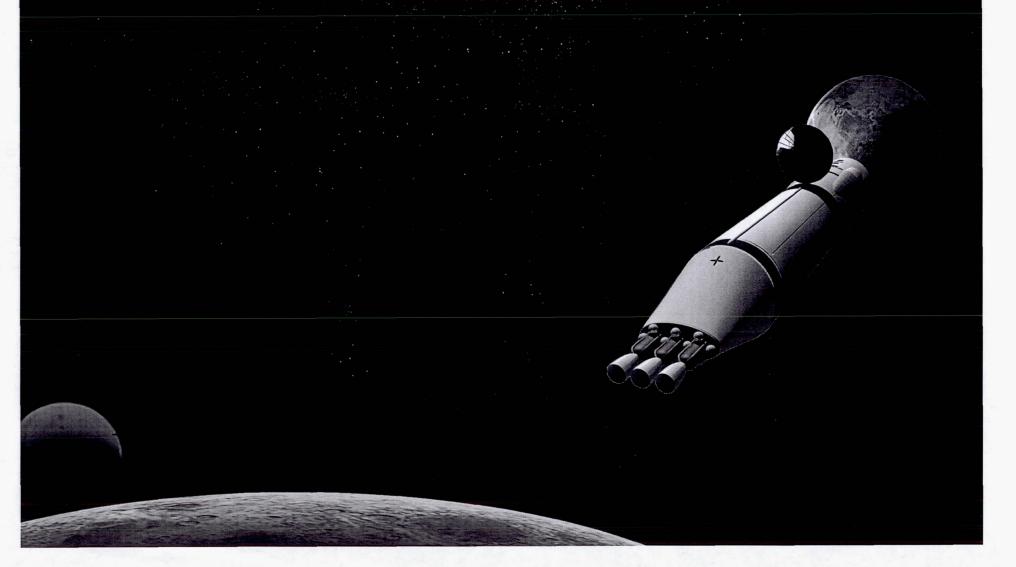
structural transition to launch vehicle



















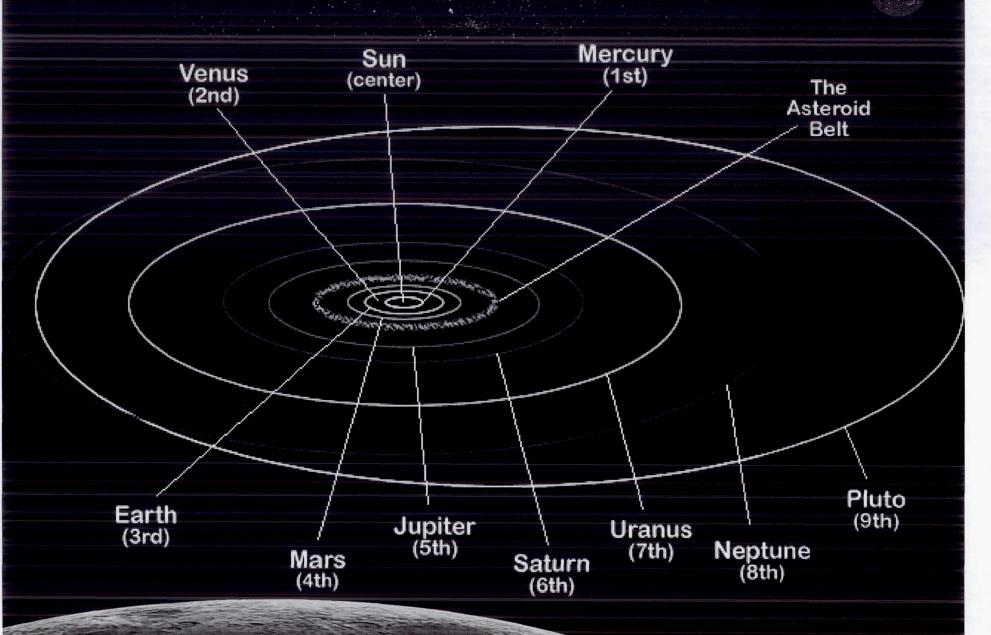
Sun •

#### Milky Way Galaxy - Our Home

In grains of sand

esurements... nearest star, 100,000 Light Years ima auri, is 25 miles (actually light-years) Sun center of our (Approx: ky would be position) 005,024 Nucleus s from the Central Bulge (actually 00 light-Photograph \* Anglo-Australian \*Observatory





#### Milky Way Galaxy - Our Home

One of the fastest objects made by ans are the ger ecrafts ched in these ecrafts are raveling at 35,000 mph is about 10 per nd at those ds it will nearly 0 years for oyager to

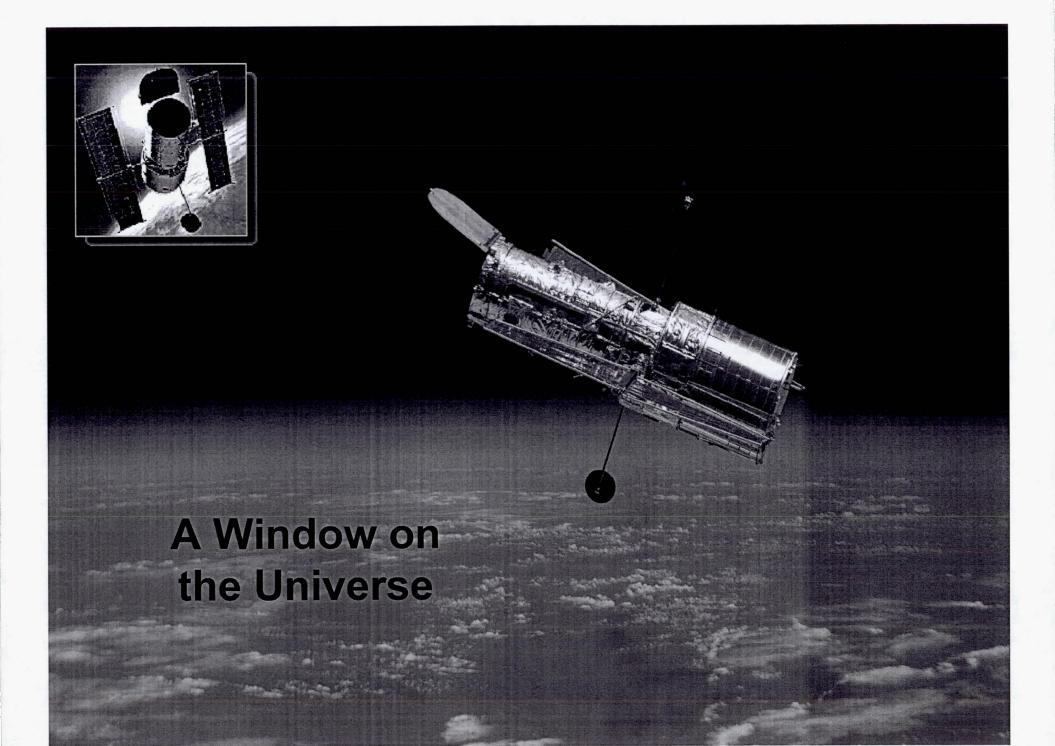
Proxima

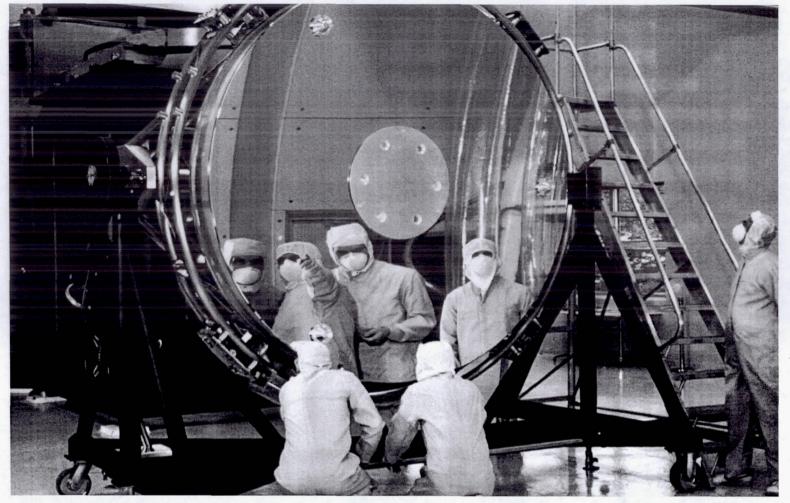
100,000 Light Years Sun (Approx:/ position) Nucleus Central Bulge

#### Voyager 2 - Launch Aug 20 1977



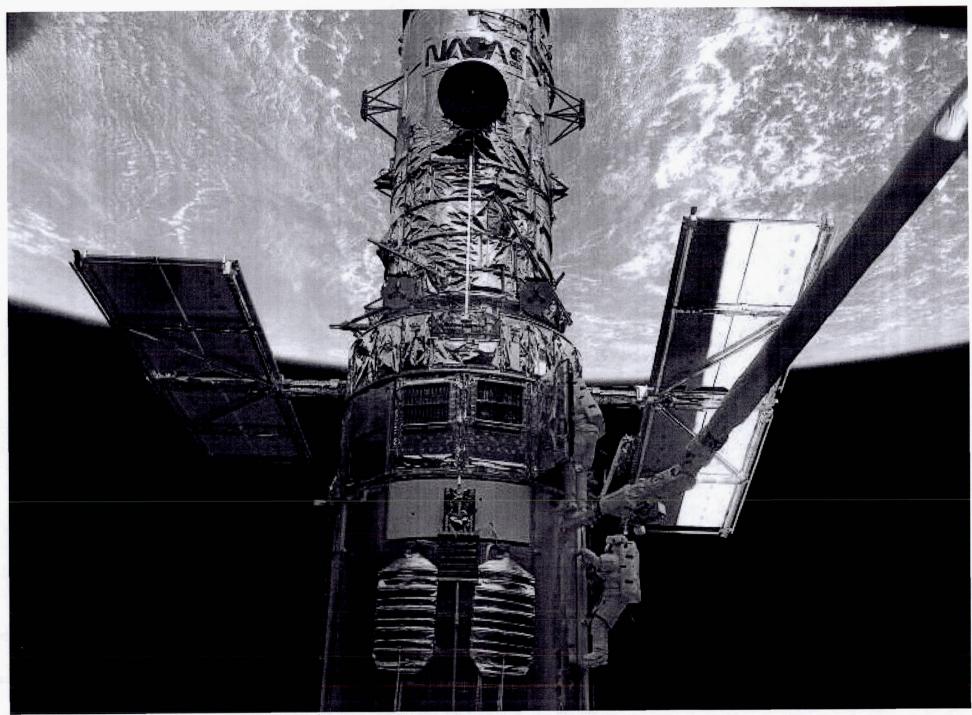
It would take 47,393,360,000 years to reach our closest sister Galaxy – The Great Andromeda Galaxy



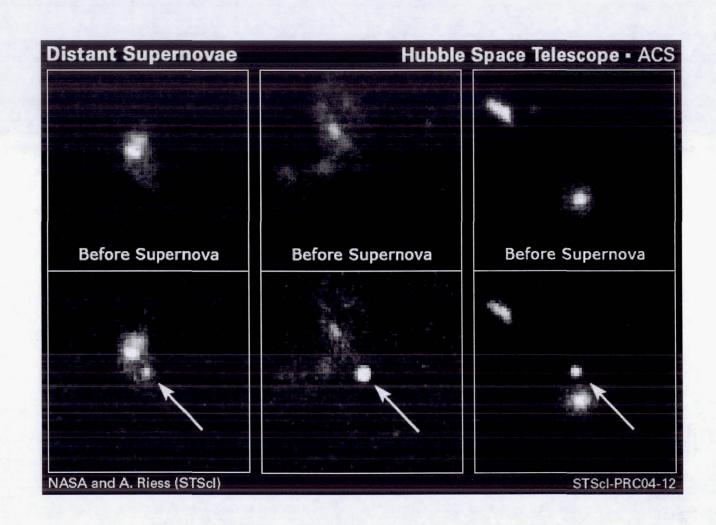


After Hubble's launch in 1990, NASA discovered a flaw in the large, main mirror. The flaw was tiny — about 1/50th the thickness of a piece of paper — but significant enough to distort Hubble's vision. During the First Servicing Mission, astronauts added corrective optics to compensate for the flaw. The optics acted like eyeglasses to correct Hubble's vision.

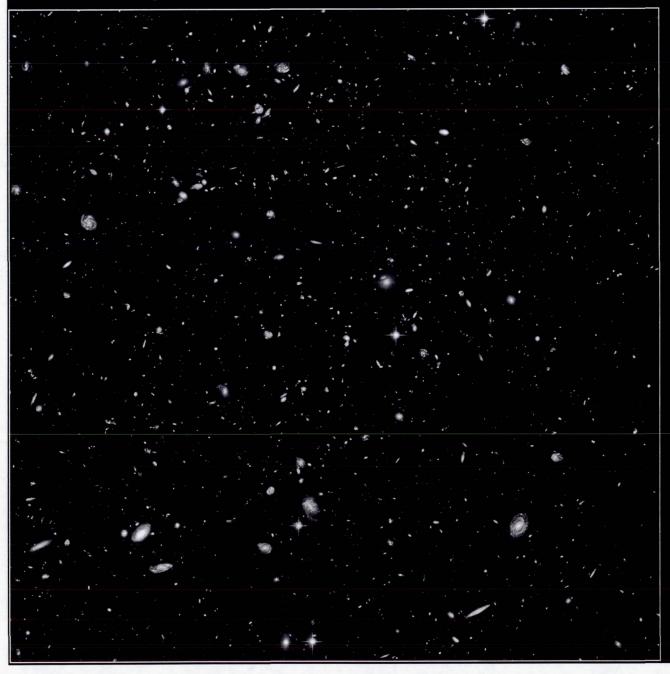
The Hubble Space Telescope uses mirrors to collect science data. Hubble's main mirror is about eight feet in diameter. These powerful instruments analyze the incoming light stream and translate it into information and images for scientists back on Earth.



## The Accelerating Universe



#### Hubble Space Telescope Deepest Views of the Early Universe



This view of nearly 10,000 galaxies is the deepest visible-light image of the cosmos.

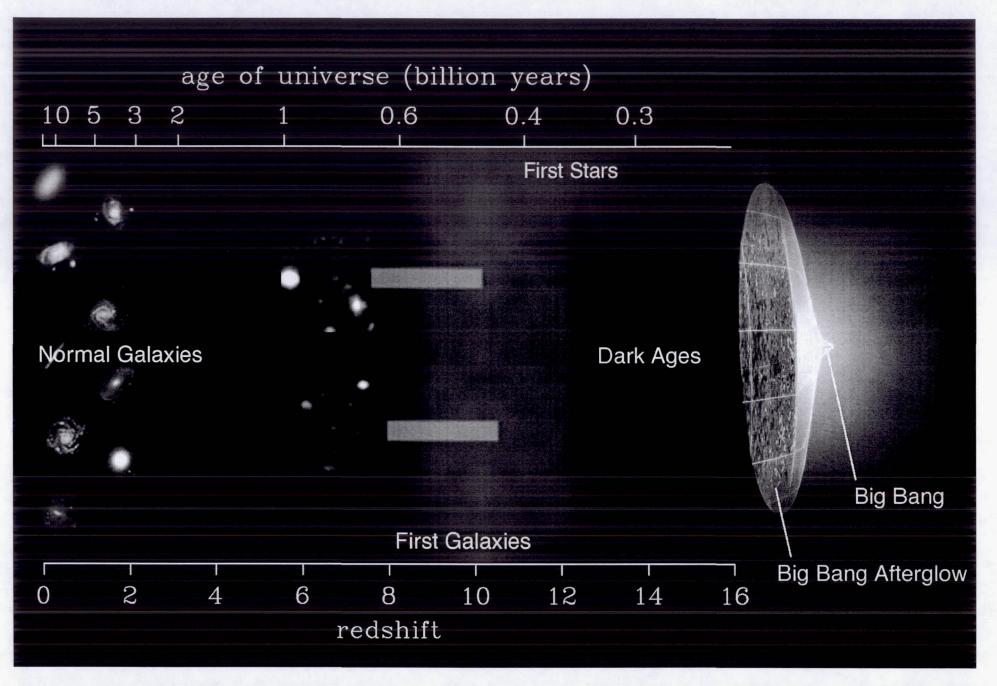
The smallest, reddest galaxies, about 100, may be among the most distant known, existing when the universe was just 800 million years old.

The nearest galaxies - the larger, brighter, well-defined spirals and ellipticals - thrived about 1 billion years ago, when the cosmos was 13 billion years old.

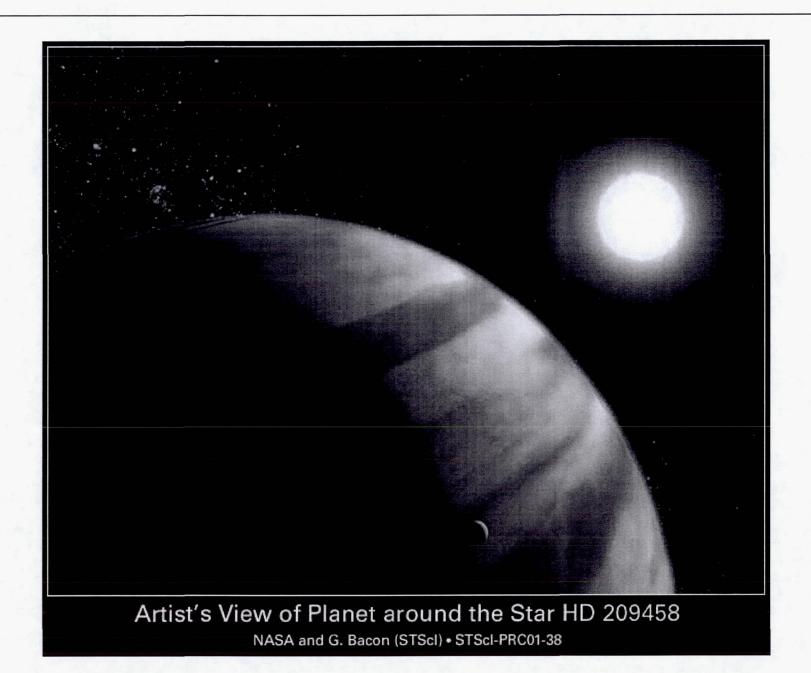
Peering into the Ultra Deep Field is like looking through an eight-foot-long soda straw.

The image required 800 exposures taken over the course of 400 Hubble orbits around Earth.

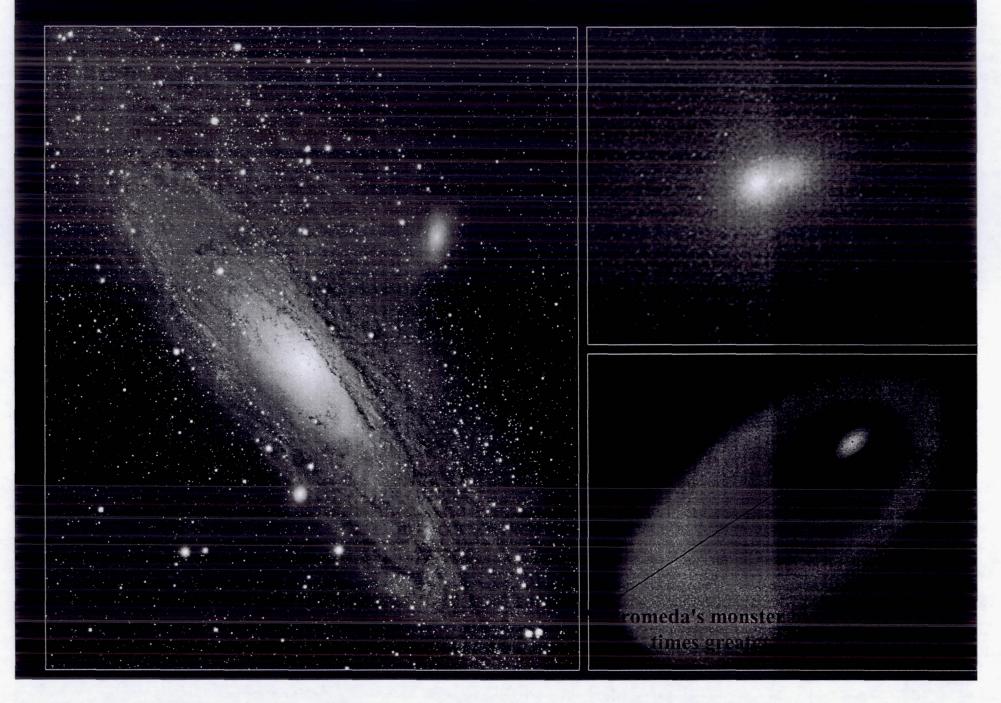
## Age of the Universe ~ 13.7 Billion Years Old



## Planets Outside Our Solar System

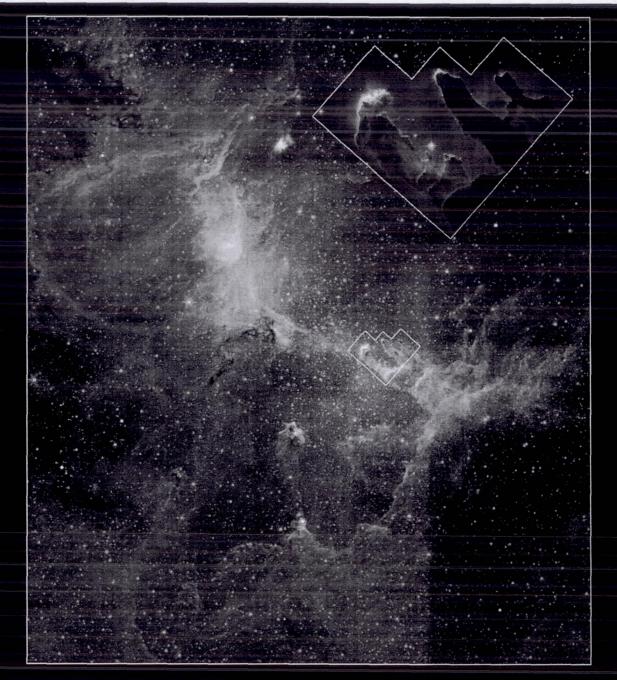


#### Monster Black Holes are Everywhere



# **Quasars - Massive Black Holes** in the Center of Distant Galaxies





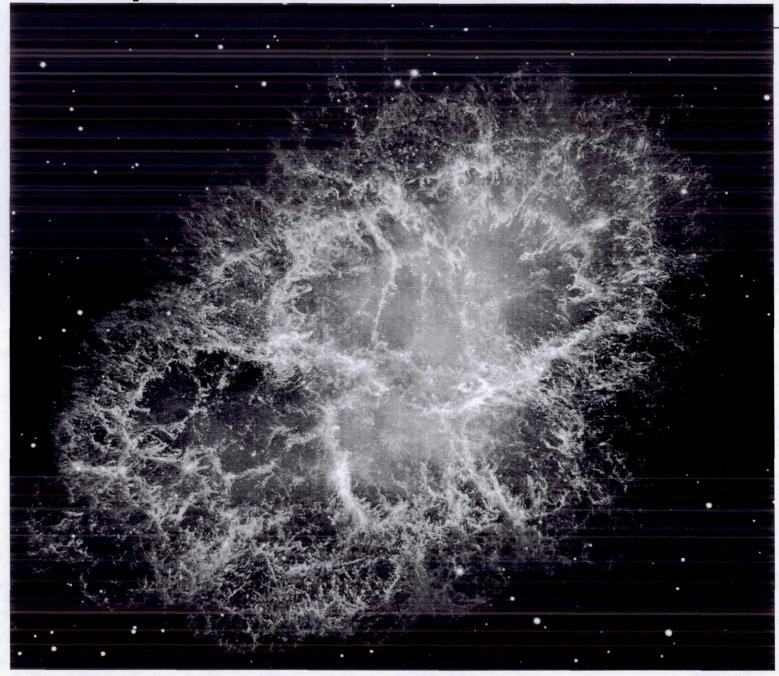
of New Planetary Systems

Infrared Eagle Nebula and the "Pillars of Creation"

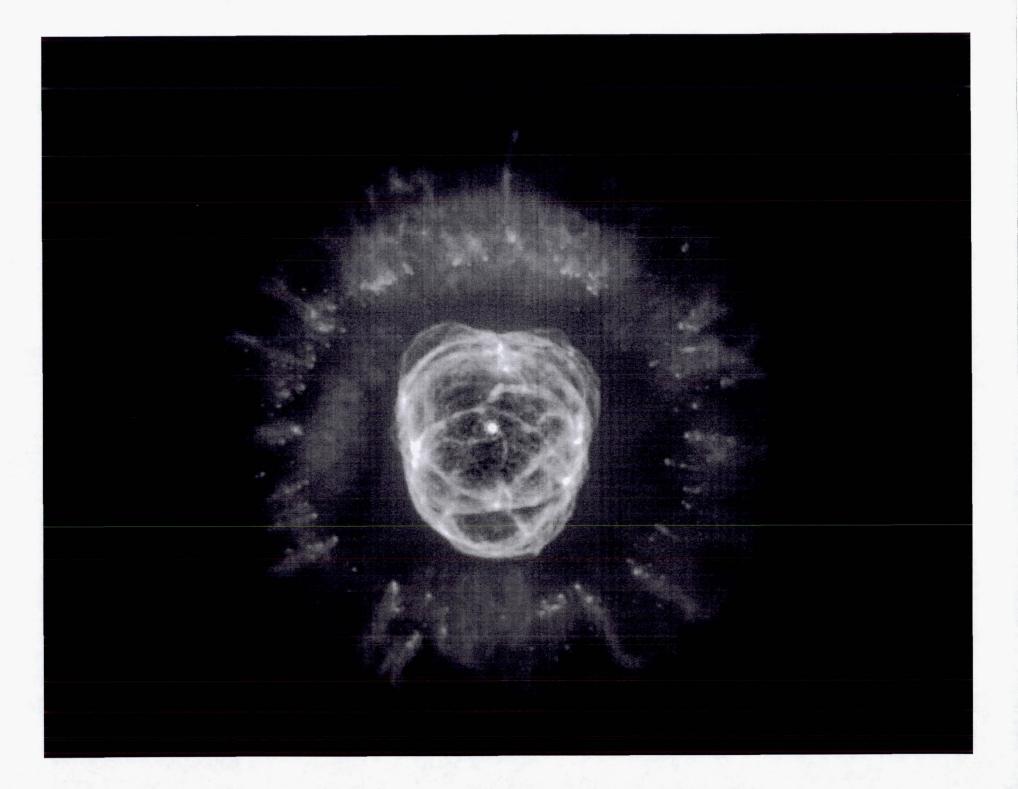
Spitzer Space Telescope • IRAC • MIPS Hubble Space Telescope (inset)



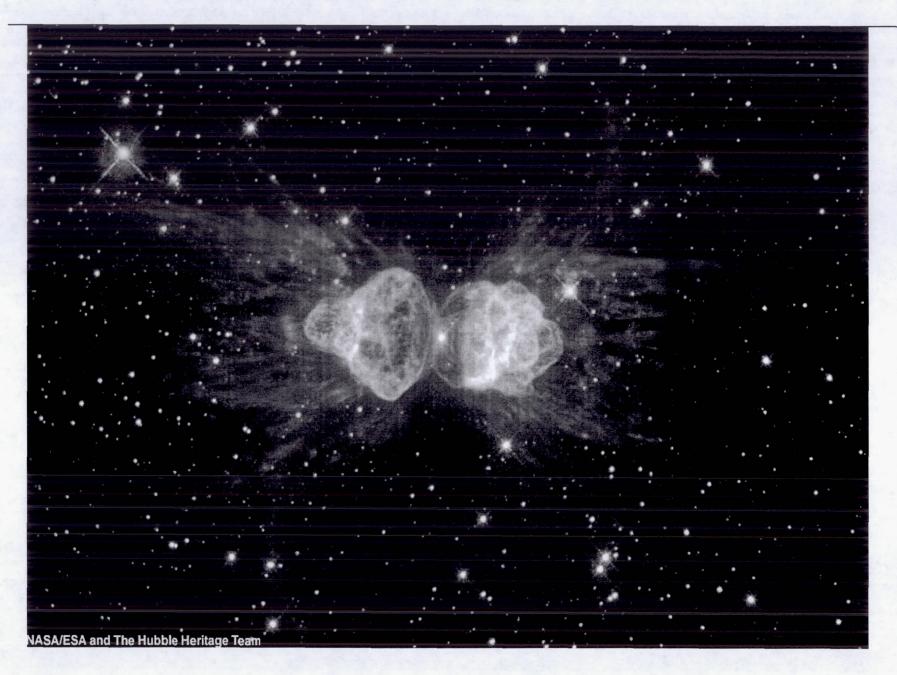
## **Unprecedented Details of Stars Death**



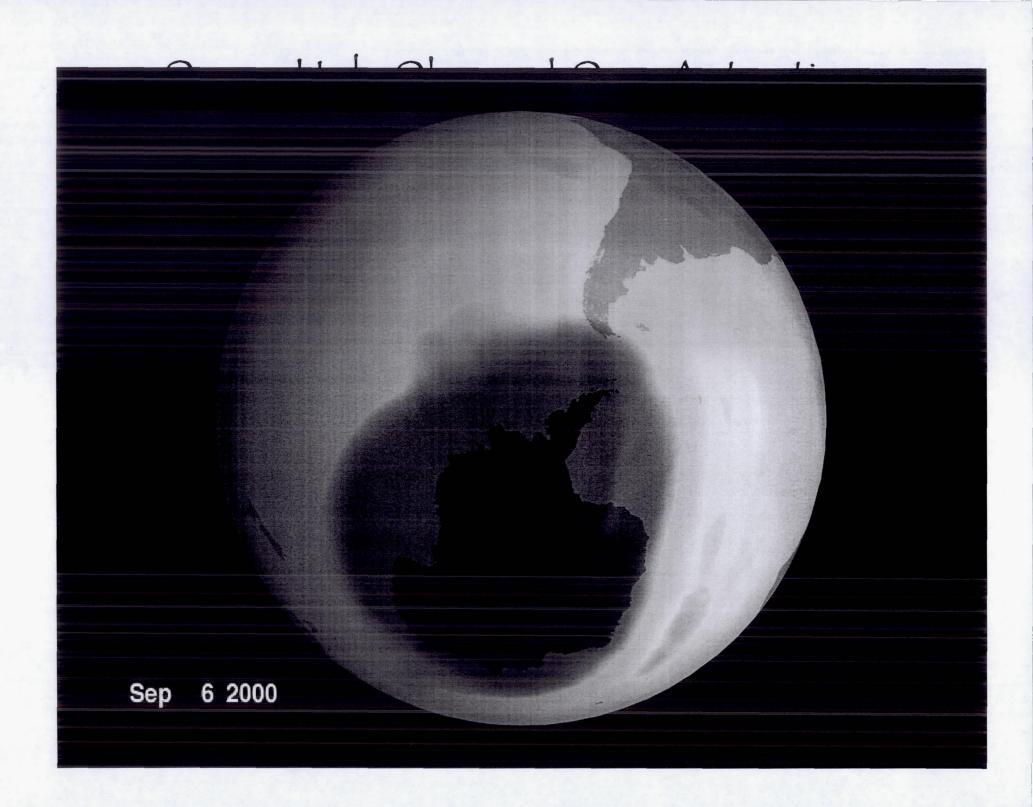
Crab Nebula

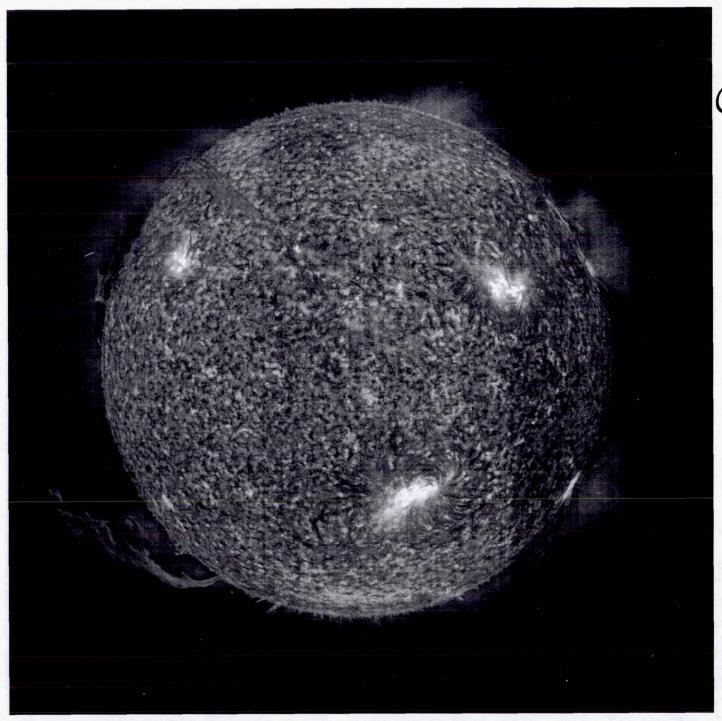


# **Unprecedented Details of Stars Death**

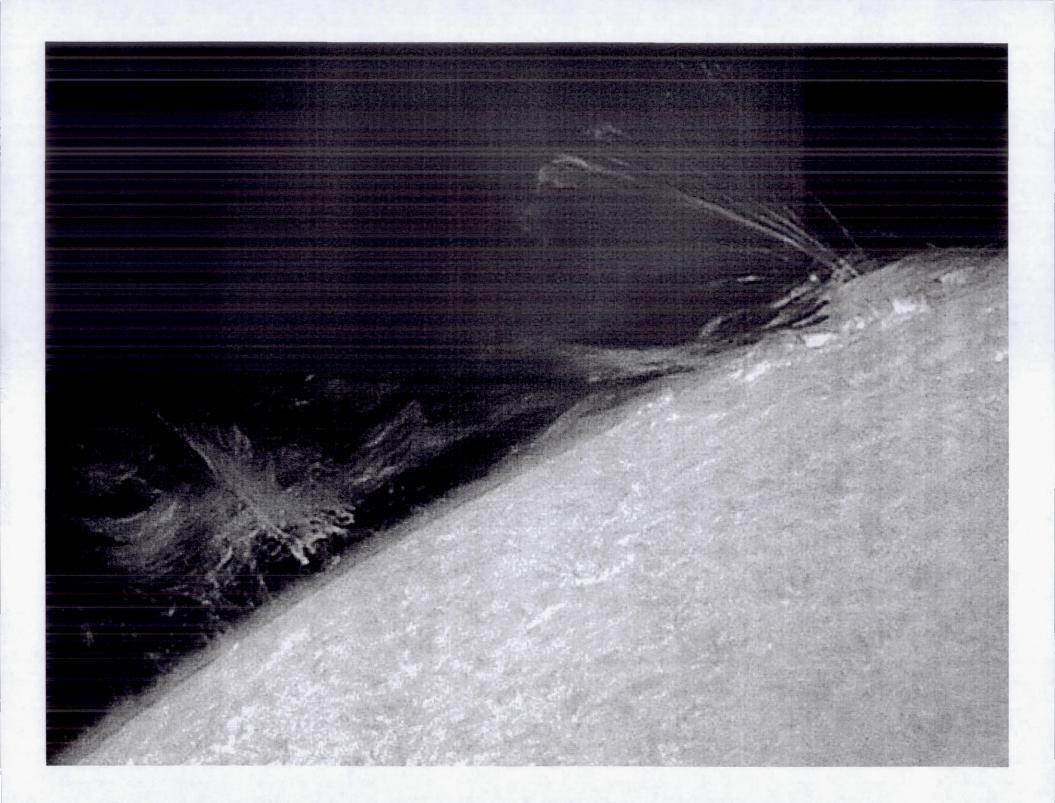


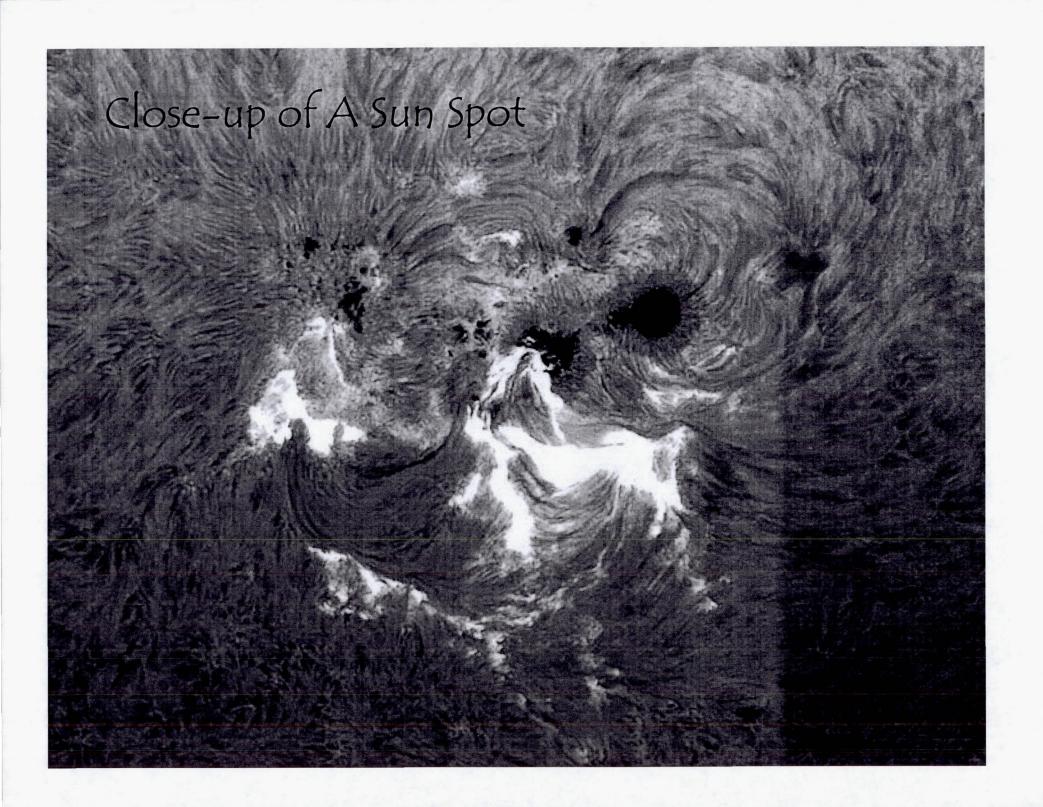


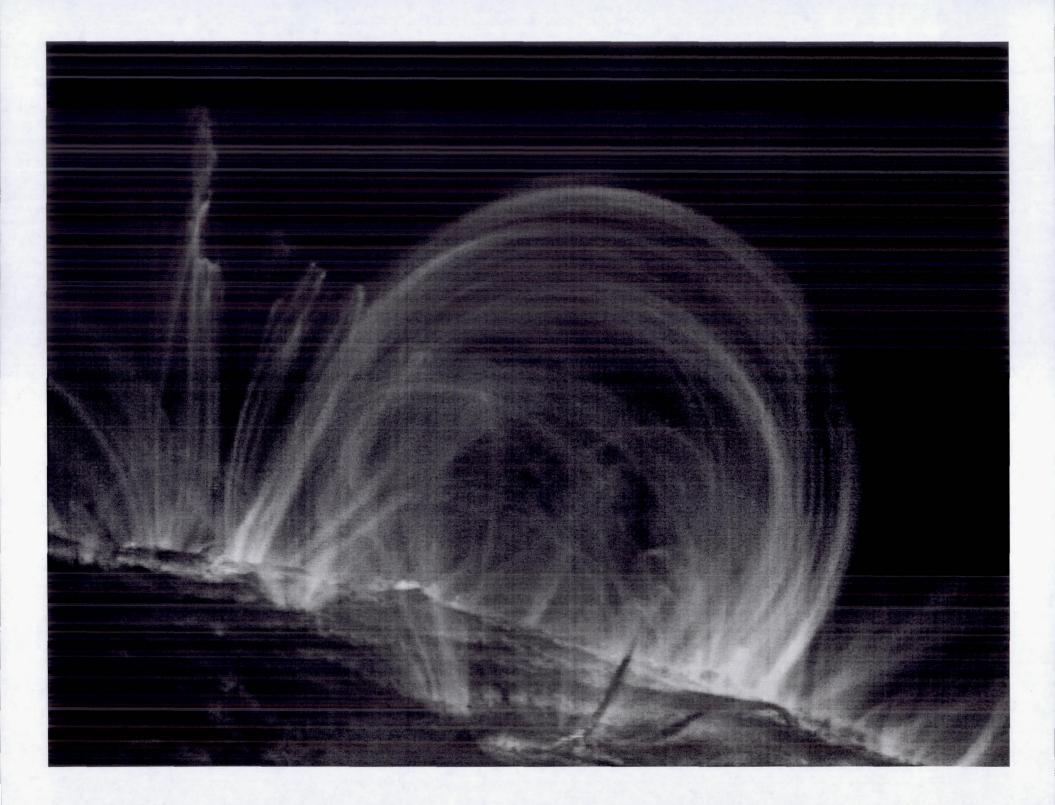




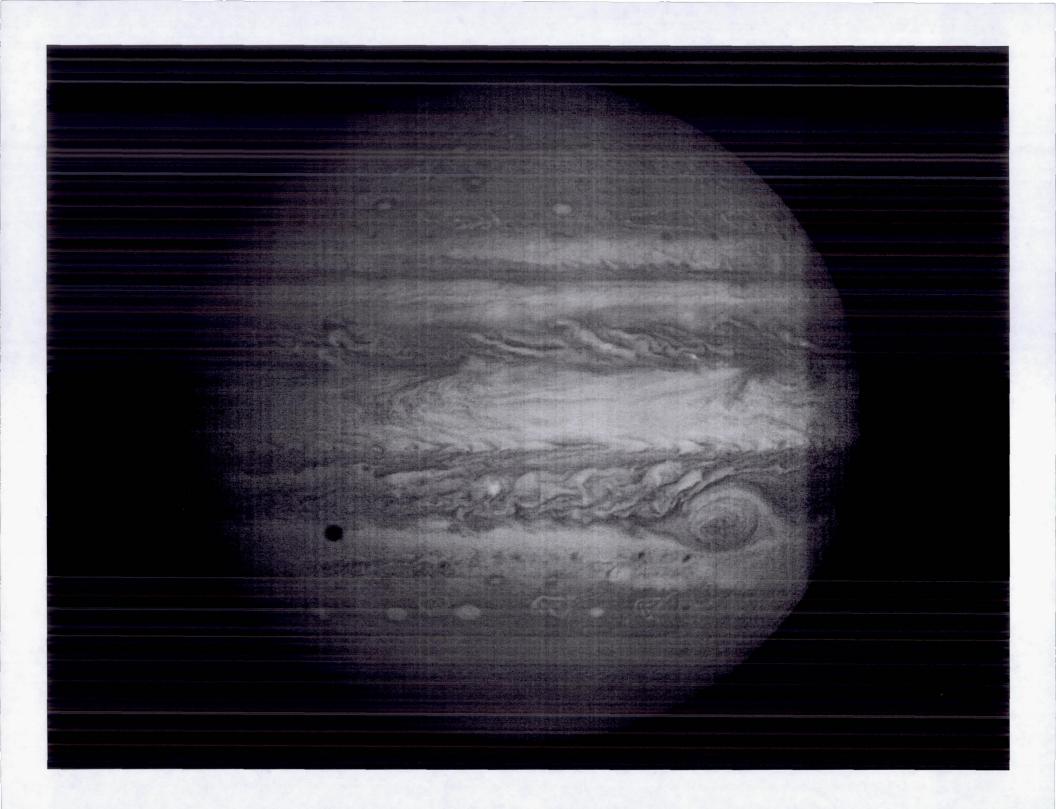
### Our Sun



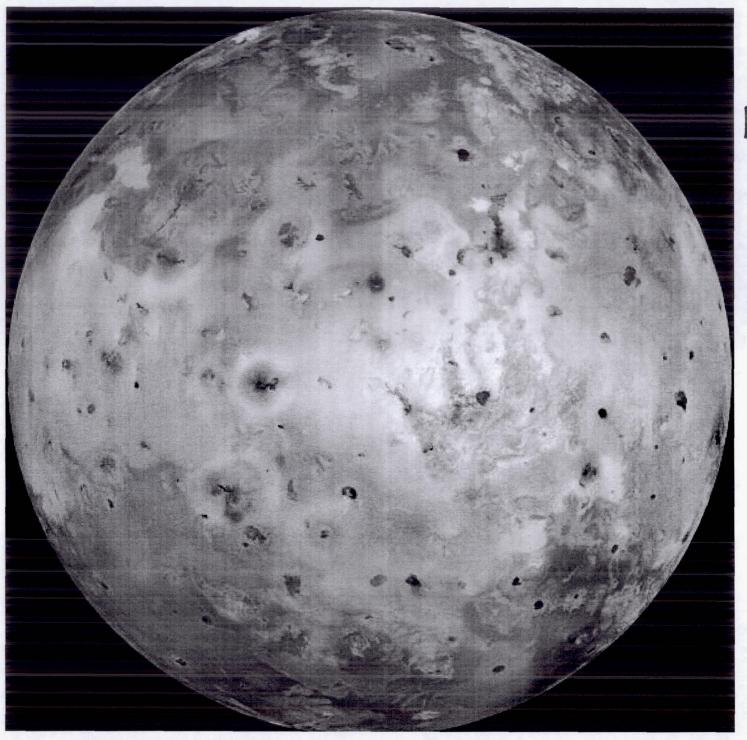




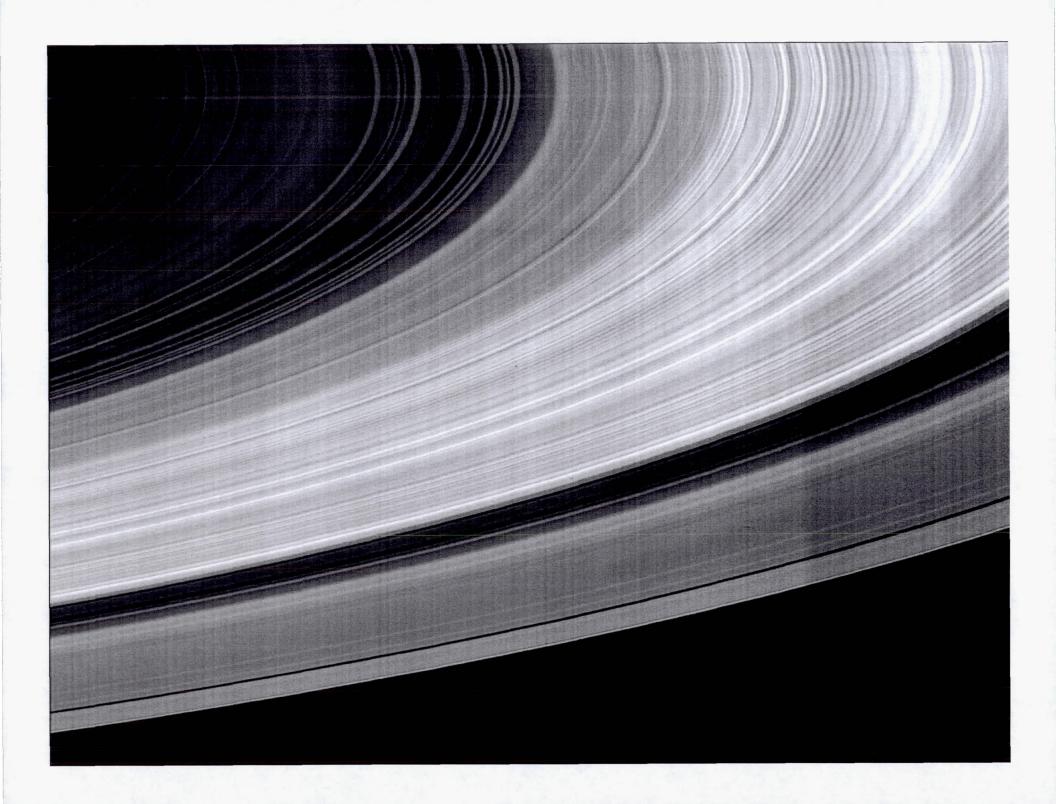


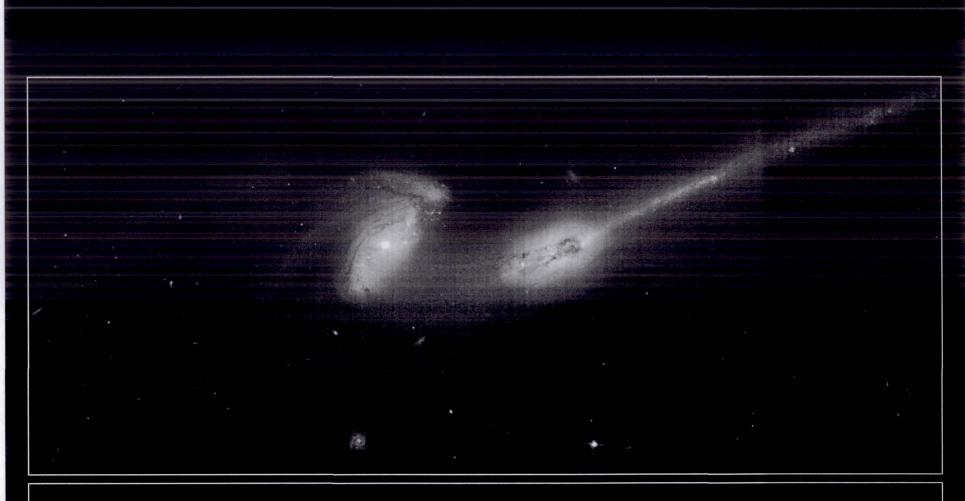






Io In True Color



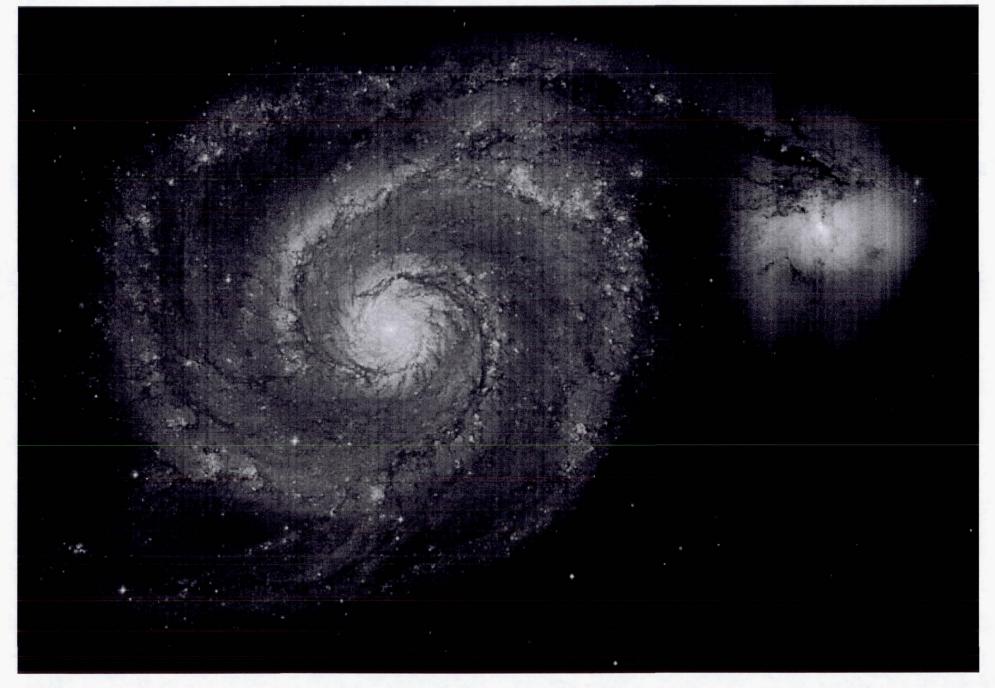


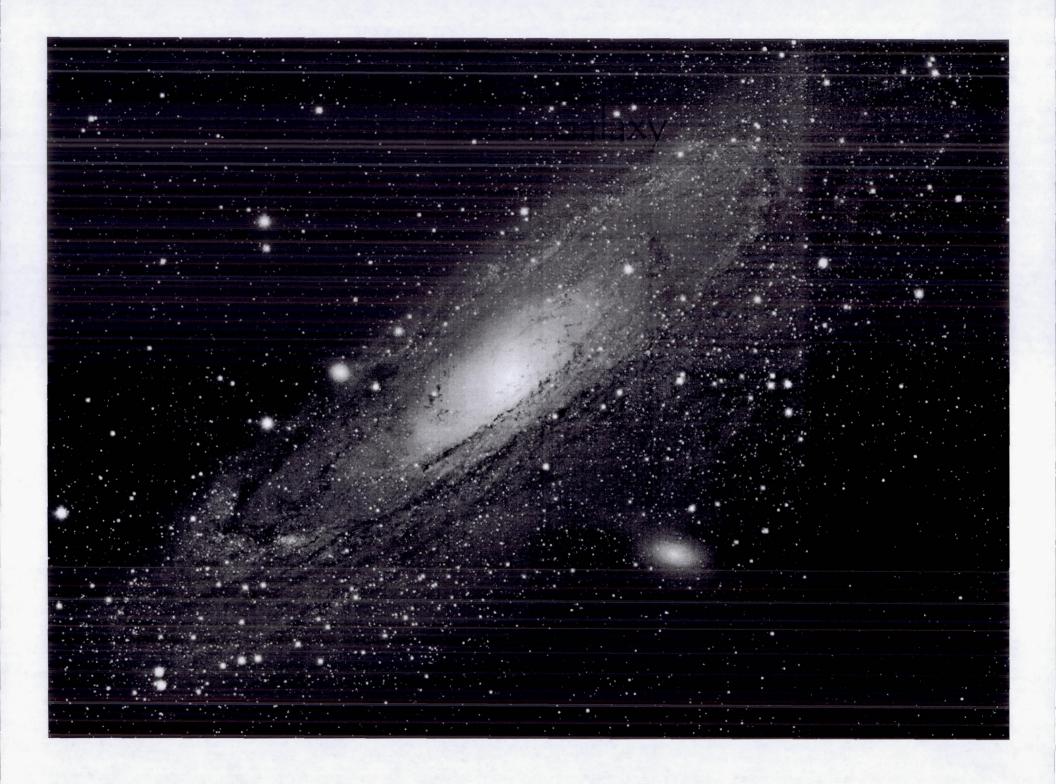
The Mice • Interacting Galaxies NGC 4676

Hubble Space Telescope • Advanced Camera for Surveys

NASA, H. Ford (JHU), G. Illingworth (UCSC/LO), M. Clampin (STScI), G. Hartig (STScI) and the ACS Science Team • STScI-PRC02-11d

### **Galaxies Colliding**





# Economic Impact of KSC and NASA in Florida - FY 2006

### **Economic Impact of NASA in Florida - 2006**

### Analysis completed 3 levels

- Local (Brevard Co.)
- Regional 7 county area
  - Brevard
  - Flagler
  - Lake
  - Orange
  - Osceola
  - Seminole
  - Volusia
- State

### **Economic Impact Methodology**

### Economic Input

- Achieved through several factors
  - KSC wages and procurements
  - Other NASA Centers procurements
  - KSC Visitors Center wages and spending
    - by out-of-state visitors
  - Business visitors to KSC

### Economic Output

- Generated via economic model, estimating the impacts the spending has throughout various sectors of the economy
  - Utilized Minnesota IMPLAN Groups (MIG) software model

### **Economic Input**

- Direct expenditures of KSC and other NASA Centers into Florida economy = \$1.69 billion
  - Brevard Co. reaps largest benefit... \$1.6 billion (95%)
- NASA managed <u>1,731 contracts</u> in the State of Florida
  - KSC managed 1,204 contracts valued at \$959 million
  - 8 other NASA Centers managed 527 contracts in FL valued at \$564 million
    - Shuttle Processing Operations Contract (SPOC) contract = \$501 million

### **Economic Input**

#### 13,630 workers employed at KSC

- 84% of workers are prime contractors
- 84% of all workers reside in Brevard Co.
  - 2000 KSC workers reside in neighboring counties
- \$984 million in wages earned
- Avg. salary = \$72,000 (twice the \$36,000 avg salary in Brevard Co.)

#### KSC Visitors Center

- KSCVC had 695 employees with \$21 million in wages
- 836,000 out-of-state visitors
  - These visitors spent \$46 million in purchases

#### KSC Business Visitors

 8,000 business trips to KSC spending \$2.9 million on area hotels, restaurants, rental cars, etc.

### **Economic Output**

- Overall Economic Impact
  - \$3.6 billion impact to State of Florida
  - \$1.8 billion in household income
  - <u>34,000</u> jobs
  - \$177 million federal taxes
  - \$83 million state/local taxes
  - ~ 93% of the total impact occurred in the sevencounty Central Florida region
  - ~ \$2.8 billion overall impact to Brevard Co., accounting for over 28,000 jobs

### **Economic Multipliers**

- Each <u>KSC job</u> multiplied into 2.45 jobs throughout the Florida economy
- Each \$1 of <u>NASA wages</u> multiplied into \$1.78 total income in Florida
- Each \$1 of <u>NASA spending</u> generated \$2.14 in statewide output

### **Economic Impact of NASA in Florida Trend**

 The 4-year trend of NASA's economic impact on the state of Florida

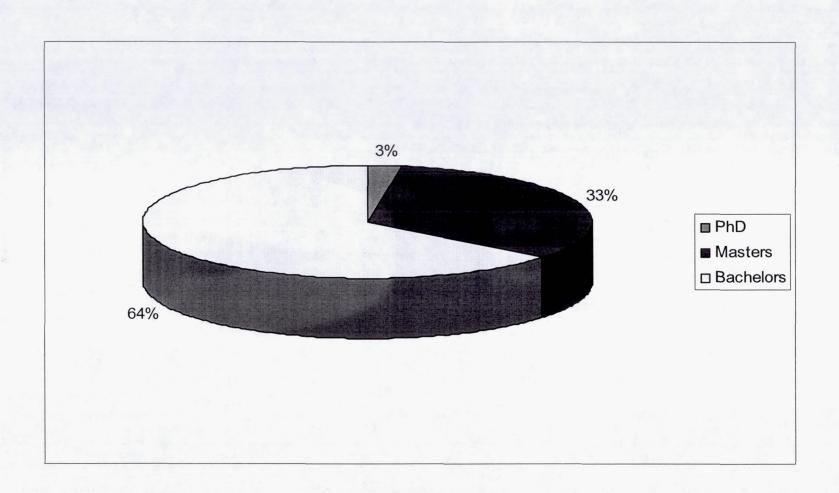
FY 2003 \$3.1 billion
FY 2004 \$3.3 billion
FY 2005 \$3.7 billion
FY 2006 \$3.6 billion\*

<sup>\*</sup> KSC budget decreased in FY 2006 by over \$100 million from FY 2005 level

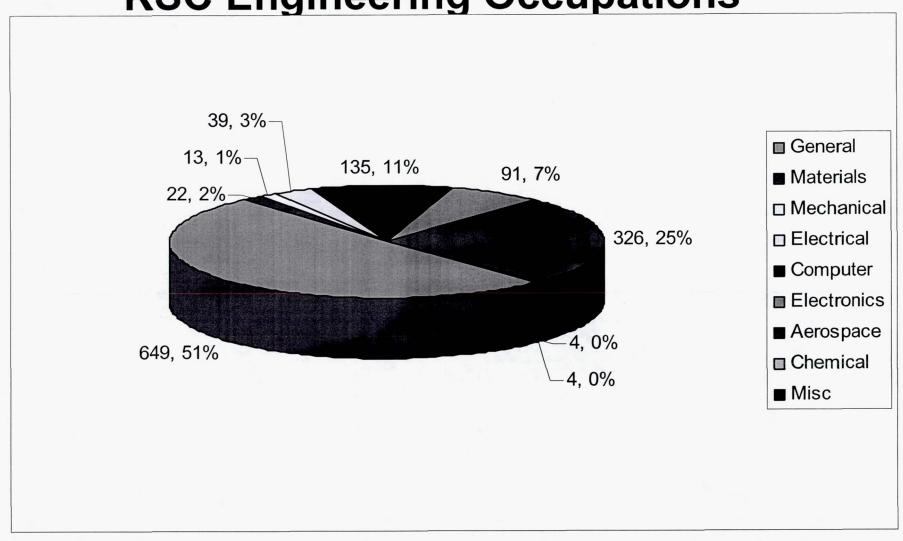
### The Rest of the Story

- Overall economic impact would be greater than reported if other activities were included, e.g.
  - Commercial launch spending/employment
  - Stakeholder employment and operations (e.g. Space Florida, FSRI, etc.)
  - Patrick AFB/45SW is not included, but they produce a separate report

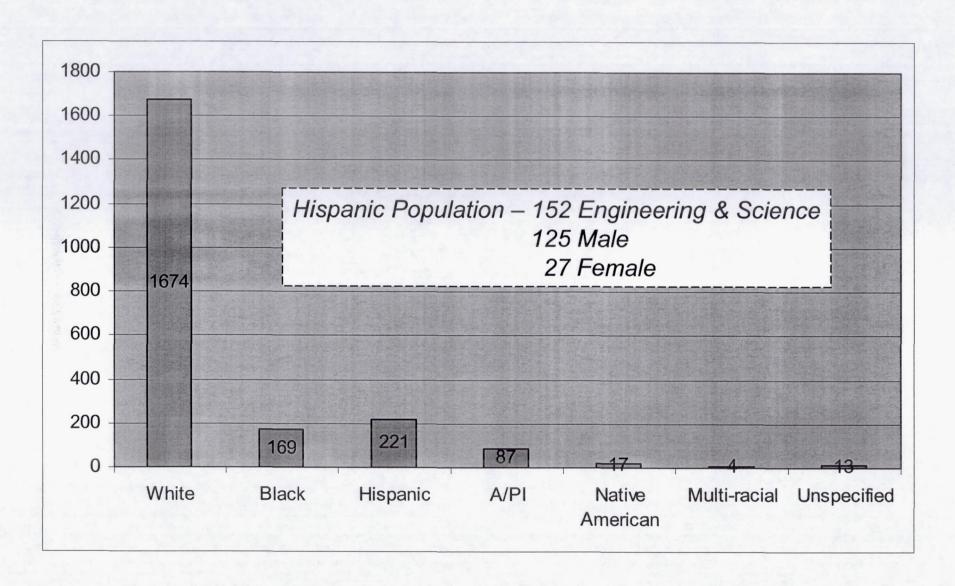
### **KSC Educational Levels**



### **KSC Engineering Occupations**



### **Diversity Snapshot**





## NASA Web Site

# http://spaceflight.nasa.gov

